UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 27 1999

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

Mr. Neal Maxymillian, Vice President
Maxymillian Technologies, Inc.
84 State Street
Boston, Massachusetts 02109

Dear Mr. Maxymillian

By this letter, the National Program Chemicals Division (NPCD) of the U.S. Environmental Protection Agency (EPA) amends the Maxymillian Technologies, Inc. (Maxymillian) PCB Disposal Approval to operate the mobile Indirect Thermal Desorber System (IDS), a polychlorinated biphenyl (PCB) alternate thermal disposal method. Enclosed is the amended approval, entitled "Approval to Dispose of Polychlorinated Biphenyls (PCBs)," authorizing Maxymillian to remove PCBs from soil, subject to the listed conditions of approval. This approval is issued pursuant to Section 6(e)(1) of the Toxic Substances Control Act (TSCA) of 1976 (Public Law 94-469), and the Federal PCB Regulations, 40 CFR Part 761.60(e) (48 FR 13185, March 30, 1983). This approval terminates on September 29, 2003.

This approval authorizes Maxymillian to remove and dispose of PCBs from soil nationwide. Maxymillian demonstrated the IDS at the AAG Fairgrounds Avenue Stockpile Site in North Adams, Massachusetts on March 25 and 26, 1999. Results of the demonstration were submitted June 2, 1999. Emission sampling results indicated that the IDS, an alternative PCB thermal disposal technology, met or surpassed the standard for PCB disposal incinerators, 99.9999% destruction and removal efficiency (DRE). PCB DREs for two demonstration tests were 99.9999996% and 99.99999992% corresponding with emission rates of 38.1 and 6.50 nanograms/second (ng/sec). Dioxin and furan emission concentrations, expressed as 2,2',4,4'-tetrachlorobiphenyl TEQ (toxic equivalent quotient) ng/dscm (nanogram/dry standard cubic meter), were 2.65E-03 and 3.37E-03 ng/dscm. Emission rates for dioxins and furans were 30.3 and 33.3 picograms/sec TEQ respectively. Whenever Maxymillian performs an emission test upon request or as required by EPA or other agencies, an interim dioxin/furan TEQ emission concentration of one (1) ng/dscm is imposed. Treated soil for three test runs were 0.28, 0.49 and 1.18 ppm PCBs.

NPCD imposes several site-specific operating conditions. One involves the carbon adsorption units which are major components of the air pollution control system (APCS). With use, the carbon becomes saturated with organic compounds and must be replaced. The frequency of replacement is dependent on the quantity and the quality of the organic makeup of the site soil. Maxymillian developed a technique to estimate the effective operating life of adsorptive carbon based on field data. Carbon replacement frequency must be estimated using procedures

submitted by Maxymillian on July 6, 1998, entitled "Vapor Phase Carbon Usage Model for Maxymillian Technologies Indirect Thermal Desorber, July 1998." Maxymillian must maintain, on site, a copy of this document for review by EPA or its designated agents whenever operating the IDS.

The second condition involves the soil treatment temperature. Maxymillian successfully remediated two sites contaminated with PCBs, the South Glen Falls Drag Strip Site in Moreau, New York and the Fairground Avenue Site in North Adams, Massachusetts. Soil treatment temperatures averaged about 680°F and 714°F, respectively, at the two sites. These two sites contained relatively sandy and gravelly soils, one with high organic content (vegetation), the other with relatively low organic material. Although these two sites were successfully treated with soil temperature neighboring 700°F, soil with some clay content and higher organic content may require more aggressive conditions for PCB removal. Thus, EPA requires Maxymillian to establish site-specific treatment temperature necessitating testing and analysis of the treated soil prior to production operations.

Therefore, at each site, Maxymillian must establish carbon replacement frequency and soil treatment conditions prior to full remediation operations. These conditions must be based on site-specific data. Analytical results and rationale must be readily available for review by EPA and or its designated agents. See Condition 3.a of this Approval for details.

Please note that Condition 18 "Financial Assurance" of the approval requires Maxymillian to submit a site closure financial assurance instrument prior to start up of TSCA operation. In addition, Maxymillian is required to submit to the Chief, Fibers and Organics Branch, annual updates of the financial assurance for closure and financial requirements.

This approval may be modified, withdrawn, or further conditions may be added at any time EPA has reason to believe that the operation of the IDS presents an unreasonable risk of injury to health or the environment. Withdrawal of the approval or imposition of further conditions may also result from future EPA rulemaking with respect to PCBs, or from new information gathered at a demonstration site or during subsequent jobs at other sites. Moreover, violation of any condition of this approval may subject Maxymillian to enforcement action, suspension and/or termination of this approval.

Finally, this approval is based upon the EPA conclusion that the IDS, when operated in accordance with the conditions of approval, does not present an unreasonable risk of injury to health or the environment. Please contact the PCB Disposal staff at (202) 382-3933 if you have any questions regarding this approval.

Sincerely,

John W. Melone, Director
National Program Chemicals Division

Enclosure

cc: EPA Regional PCB Coordinator
USEPA, Regions I - X

Cathy Wanat
Massachusetts DEP

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

IN THE MATTER OF MAXYMILLIAN TECH-	)	APPROVAL TO DISPOSE
	)	
NOLOGIES, INC. OF PITTSFIELD,	)	OF POLYCHLORINATED
	)	
MASSACHUSETTS	)	BIPHENYLS (PCBs)

AUTHORITY

This approval is issued pursuant to Section 6(e)(1) of the Toxic Substances Control Act of 1976 (TSCA), Public Law No. 94-469, and the Federal PCB Regulations, 40 CFR 761.70 (44 FR 31542, May 31, 1979; 47 FR 19527, May 6, 1982; 48 FR 13185, March 30, 1983; 49 FR 28191, July 10, 1984; 53 FR 12524, April 15, 1988). Background and Findings related to this approval are attached as Appendix I and II.

Maxymillian Technologies, Inc. is the sole owner and operator of a process known as the Indirect Thermal Desorber System or the Indirect System (IDS) which thermally removes and destroys PCBs in soil. Pursuant to 40 CFR 761.60(e), the Environmental Protection Agency (EPA) finds that the IDS, Maxymillian's thermal desorption process (when operated in accordance with the conditions of this approval) does not pose an unreasonable risk of injury to health or the environment.

EFFECTIVE DATE

This approval to operate nationwide shall become effective on August 30, 1998 and expire on August 30, 2003.

FOREWORD

If any administrative or procedural requirement of this approval has been satisfied by other parties (e.g., completion of a risk assessment, financial responsibility for a specific site), Maxymillian is relieved of that requirement. Maxymillian shall remain responsible for operational requirements; e.g., sampling of soil feedstock although the site has been well characterized for PCB concentration.

CONTENTS

II Summary of Results from the Maxymillian TSCA PCB Disposal Demonstration at the AAG Fairgounds Avenue Stockpile Site in North Adams, Massachusetts, March 25 & 26, 1999

III Summary of Results from the Maxymillian TSCA PCB Disposal Demonstration at the AAG Fairgrounds Avenue Stockpile Site in North Adams, Massachusetts, September 16 - 19, 1998

IV Summary of Results from the Maxymillian TSCA PCB Disposal Demonstration at the South Glen Falls Drag Strip Site in Moreau, New York, May 29 - 31, 1996 and August 23, 1996

V. Results of R&D Studies, South Glen Falls Drag Strip, Moreau, New York, 1995

DEFINITIONS

"Analytical data" means (a) a formal report from a chemical analysis laboratory or (b) appropriate chemical instrument print outs with appropriate controls, standards, and written instrumental operating parameters and conditions or (c) a statement that the "assumption" rule has been used. Technical judgement or experience is not considered analytical data.

"Appropriate local jurisdiction" means the incorporated city where the Indirect System unit will be operated, or the county, if the Indirect System unit will be operated outside the boundary of an incorporated city.

"Business hours" means 8:00 a.m. to 5:00 p.m. local time on weekdays except United States Government Holidays.

"Change in scale" means a 50% increase or more of the volume of Waste Feed notified to be treated at a facility.

"Day" means a calendar day, unless otherwise specified.

"Duplicate analysis" means two gas chromatographic analyses of the analyte prepared from one sample of material.

"Facility" means the geographically contiguous property unit (such as a single manufacturing plant) at which the Indirect System disposal operations are conducted.

"Facility location" means a street address or a directional description which would allow a facility to be found by an EPA inspector.

"Frequent facility changes" means facility changes at a rate of more than once per week.

"Job" means all Indirect System disposal operations for a single customer within fifty road miles of a central location. A job may consist of Indirect System disposal operations at several different facilities for a single customer.

"Lifetime exposure risk" means the risk to an average adult individual who is exposed to a stated average concentration of a toxic material daily over the course of a 70 year lifetime.

"Lost time injury" or "Lost workday injury" means an injury related to the operation of the Indirect System process which results in an employee not performing his/her normal assignments during the workday and/or any successive workday(s) following the day of the injury.

"Major modification" means any change to capacity, design, or efficiency of the Indirect System unit or process, change of waste type, or any other changes significantly affecting overall performance or environmental impact.

"Minimal," with regard to an amount of PCB wastes means less than ten percent (10%) of total wastes treated.

"Mobile operations" means those operations where the Indirect System mobile unit remains at a facility for less than 180 consecutive days.

"Non-soil" solids and materials include non-pumpable sludge and sediment. Non-soil solids includes soil with greater than 35% water. Typically, non-soil may include solids such as lake and river sediment, ashes, mill tailings which exhibit non-pumpable characteristics.

"Operations" means the process of treating PCBs, including start-up of the Indirect System, preparation of hazardous waste feed, including PCBs, and decontamination of the Indirect System unit and supporting components at termination of treatment, as well as actual treatment.

"OPPT" means the Office of Pollution Prevention and Toxics (7401); (202) 260-3815; Fibers and Organics Branch (7404); (202) 260-3933; Facsimile (202) 260-1724.

"PCB" means polychlorinated biphenyls as defined in 40 CFR 761.3.

"PCB release" and "PCB spill" have the same meaning as "spill" as defined in EPA's PCB Spill Cleanup Policy in 40 CFR 761.123.

"Permanent operations" means those operations where the Indirect System mobile unit remains within the area of the facility for 180 consecutive days or longer.

"Process Failure" means the inability of the Indirect System unit to treat the feedstock for reasons other than contaminants (such as chlorinated solvents).

"Remediation site" or "site" means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of a cleanup of PCB remediation waste regardless of whether the site was intended for management of waste.

"Sludge" is defined as non-liquid, non-soil materials from industrial and commercial operations such as tanks, lagoons and ponds. These material are also referred to as "non-soil solids." Sludge from non-industrial and non-commercial locations are not included in this definition but are addressed in Condition 2.

"2 ppm PCBs" treatment criterion is defined as follows: (a) When Aroclor patterns are detected in the chromatogram of treated material, the Aroclor will be quantified using Method 8080 (or EPA-approved equivalent method, e.g. Method 680), then the criterion for PCBs in the treated sample is "less than 2 ppm total PCBs (as calculated by comparison of total areas or height to an external Aroclor standard having a similar pattern to the sample," or (b) When Aroclor patterns do not exist, the sample will be quantified using the DCMA method (or EPA-approved equivalent method), then the criterion is "less than 2 ppm per PCB congener (or per resolvable gas chromatographic peak, as calculated by comparison to an external standard homolog peak having the nearest retention time to each appropriate PCB peak to be quantified)."

"Year" means 365 days.

CONDITIONS OF APPROVAL

The Maxymillian Technologies, Inc. (Maxymillian) Indirect Thermal Desorber or Indirect System (IDS), as described in the design drawings, modifications and clarifications on file in the Office of Pollution Prevention and Toxics, and as demonstrated to EPA during May 29 - 31, 1996 and August 23, 1996, and during September , 1997, may be used by Maxymillian to remove PCBs from PCB-contaminated soils under conditions and restrictions contained in the following paragraphs.

1. Advance Notification

a. Overview.

Maxymillian shall provide a nonconfidential, advance written notification of intent to operate which must be received by the addressees (as described below) prior to the conduct of a permitted PCB disposal activity. The addressees shall include, at a minimum: The appropriate EPA regional office, the appropriate state agency, and the appropriate local jurisdiction.

The written advance notification requirements are divided into two categories based on the length of time Maxymillian is at a single facility. In general, categories are defined below and advance written notification requirements follow:

Mobile Operations

Those operations where the IDS unit remains at a facility for less than 180 consecutive days.

Permanent Operations

Those operations where the IDS unit remains at a facility for 180 consecutive days or longer.

The information which must be included in the advance written notification for each category is described in sections 1.b.- d. below. Advance notification requirements may be waived at Superfund sites according to § 121(e) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and its implementing provisions at (40 CFR 300.400(e).

b. Mobile Operations

The following information must be included in a 30-day advance written notification under 1.a. The information is provided for public information purposes and for facilitating scheduling of government compliance monitoring and oversight of PCB disposal operations.

A. Company identification: Maxymillian's and client contacts' names and telephone numbers.

B. Names, titles, addresses, and telephone numbers of the addressees required to be notified by 1.a.

C. The nature of the PCB disposal activity, including estimates of the amount and type of PCB material to be treated (e.g., soil, sludge, sediment, dielectric fluid, hydraulic oil, heat transfer oil) and estimates of the concentration of PCBs in the material. The estimates shall be based on any one or combination of the following:

   i. Analytical data or the results of analytical data provided by the customer; or

   ii. Maxymillian analytical data; or

   iii. A statement that the customer has applied the "assumption rule" codified at 40 CFR 761.3 defining PCB-Contaminated Electrical Equipment.

D. The facility location(s) and a telephone contact(s).

E. The time(s) and date(s) the PCB disposal activity is scheduled to take place.

An acceptable sample form for the 30-day advance written notification of intent to operate under mobile operations is included as Appendix II A.

EPA CONTACTS

Name, Region	Telefax Number	Contact Number
Hiroshi Dodohara, EPA Hq.	(202) 260-1724	(202) 382-3959
Kim Tisa	(617) 565-4939	(617) 565-3257
Dan Kraft, Region II	(908) 321-6788	(908) 321-6669
Ed Cohen, Region III	(215) 597-3156	(215) 597-7668
Stuart Perry, Region IV	(404) 347-1681	(404) 347-1033
Priscilla Fonseca, Region V	(312) 353-4342	(312) 886-1334
Lou Roberts, Region VI	(214) 665-7446	(214) 665-7579
Dave Phillippi, Region VII	(913) 551-7065	(913) 551-7395
Dan Bench, Region VIII	(303) 293-1229	(303) 312-6375
Yosh Tokiwa, Region IX	(415) 744-1073	(415) 744-1118
Dan Duncan, Region X	(206) 553-0110	(206) 553-6693

c. Requirements for Changing from Mobile Operation Mode to Permanent Operation Mode

Whenever an IDS activity originally projected to be a Mobile Operations, at some point before 180 consecutive days into the operations Maxymillian determines that the unit will be located at the facility for 180 consecutive days or longer, Maxymillian must proceed as follows:

(1) Maxymillian must immediately provide written and telephone notification of this change to the EPA Headquarters' Office of Pollution Prevention and Toxics (OPPT) and the appropriate EPA regional office.

(2) The EPA Regional Administrator (RA) shall determine whether Maxymillian must cease PCB disposal operations after the 180th consecutive day. The RA shall also decide whether Maxymillian must provide OPPT and the EPA regional office a Site Evaluation, and also determine the scope of the Site Evaluation, which may include all information prescribed in sections 1.d(1) and 1.d(2) below.

(3) The RA shall determine whether public participation shall be instituted. If required, the Site Evaluation must first be approved. Then Maxymillian must provide for public notice only or followed up by a 30-day comment period along with an opportunity for a public meeting or hearing as described in section 1.d(3) below.

When the comment period is concluded, the regional office and OPPT will determine, in its discretion, that operations may proceed beyond 180 consecutive days. EPA will notify Maxymillian in writing of its approval to operate beyond 180 consecutive days.

d. Permanent Operations

For projects estimated to extend for 180 days or longer at a single site, Maxymillian must submit an advance written notification of permanent operations to the addressees at least 180 days in advance of the proposed Permanent Operations at a site. If all requirements of in Conditions 1.d.(2) and 1.d have been completed, either by Maxymillian or by other entity(s), then Maxymillian may submit the advance notification 45 days in advance of mobilization. When a Maxymillian IDS unit is to be operated at a site for 180 consecutive days or more, the following information must be included in the notification and verified by EPA to conform to the informational requirements before the 180-day review period can begin. This advance written notification shall include the following:

(1) All information required under items 1.b.(1) and (2) of Mobile Operations.

(2) Site Evaluation

The RA shall determine whether a Site Evaluation must be submitted. The Site Evaluation must be submitted to OPPT and the appropriate EPA region as part of the notice of intent to operate a permitted mobile disposal unit (MDU) at a site for 180 consecutive days or longer.

There are a number of details which were submitted to EPA as part of the original PCB disposal permit application which must be updated or revised. All of these details are directly or indirectly related to the site of operations.

A. Project Personnel

A list of names and an organizational chart, brief job description, and responsibilities for all staff to be employed by the permittee at the proposed facility. Job qualifications and training must be included. In addition, names, mailing addresses, and telephone numbers of primary Maxymillian contacts with EPA, such as environmental affairs managers or government liaison contacts. Personnel training including the time, frequency and content must be included.

B. Facility Description

The facility description shall include details of the disposal operations as they apply to the physical layout at the disposal facility. To be included are (1) a facility layout, to scale, of the location where operations will occur, and (2) the location of safety equipment, including but not limited to fire protection equipment, disposal equipment, supplies, waste handling equipment, waste loading and unloading points for transportation, flood proofing protection structures, security structures.

If the disposal operation will be at a previously developed facility, in addition to the above requirements, facility modifications must be described and justified. Buildings for personnel, construction, maintenance and laboratories are exempted, unless there are discharges from operations of a mobile unit to the environment. Any area that may be associated with any contact with PCBs or any hazardous waste handled or generated as the result of PCB disposal must be discussed, e.g., laboratory vents and sewer discharges from the laboratory. Also, discussions shall be included of all storage facilities and their containment, process water systems, and other waste stream processing.

C. Disposal Activities to Be Conducted On-Site

A summary of the process operations which are described in detail in the original permit application shall be submitted, not to exceed one typewritten single spaced page. The permittee shall discuss activities and the amount of time involved in setting up and taking down disposal operations of the MDU at the site. Also, the permittee shall provide a discussion of: monthly and annual amounts and concentrations of waste and amount of PCBs to be processed; amounts and concentrations of PCBs and other hazardous materials stored on site; amounts and concentrations of contained, controlled, and fugitive emissions of toxic and non-toxic materials and how contained materials will be disposed of; proposed hours of operations; expected duration of disposal activities at the site; and amounts of waste generated during the entire operation and how that waste will be disposed of.

D. Safety Measures

The permittee must describe systems and/or structures for the detection and/or containment of leaks and hazardous wastes/by-products, including process shutdowns resulting from automated monitoring of process emissions. A brief discussion must be included of the automatic process controls, such as those which control extreme temperature and pressure fluctuations or departure from a permitted range, must be included. The location and action plans for all other emergency equipment shall be provided. Maintenance plans and schedules shall be provided. Safety and/or quality control/quality assurance inspection schedules, procedures, and recordkeeping must be detailed.

E. Emergency Preparedness and Contingency Plans

Emergency preparedness plans, including spill prevention control and countermeasures (SPCC), must be submitted to local authorities and approved by the EPA region. These plans shall include (1) exactly what actions take place for each level of problem, (2) the names of the persons responsible for handling expected problems, and (3) facility personnel names and appropriate phone numbers for 24-hour a day contact in the ev of an emergency. Frequent problems and reasonable worst case problem scenarios must be addressed. Examples are: spills during processing, storage, and transportation; fires; floods; and equipment malfunction resulting in personal injury must be addressed. The information shall include (1) names and phone numbers of fire, police, medical emergency contacts, and (2) training sessions, documents, or other information provided to these services.

F. Transportation Routes and Volumes to be Transported to the Facility

Transportation route information shall be detailed if such routes include any roads other than interstate highways. Information shall include residential or commercial areas associated with the roads to be used by hazardous waste transporters. Amounts, volumes, and locations of off-site PCB materials which are proposed to be transported to the PCB disposal facility shall be listed. Information on the off-site and on-site storage of the off-site materials (including but not restricted to location, brief description of the release control/containment measures at the storage facility, and the estimated time to be stored at the location), shall also be listed.

G. Financial Assurance and Closure

The permittee shall summarize the financial assurance and closure provisions from the permit application including what situations are covered by insurance or other financial assurance and the amount of the assurance. Additional financial assurance and closure provisions for the time of extended PCB disposal operations at the facility must be described in detail. Maxymillian must include site cleanup procedures and copies of any bonds which may be required by a state or local authority or by the client for the Maxymillian operations.

H. Exposure Assessment

An exposure and risk assessment shall be provided for activities included in normal operations and in the event of reasonable worst case accidents/problems. The exposures shall include those resulting from: storage, contained and fugitive emissions, handling and processing PCBs and other hazardous waste/process materials, operation of industrial equipment, and transportation related releases such as spills and collisions.

The information shall include an assessment of risk to the public from:

i. lifetime exposure to process operations;

ii. the transport of PCB waste to the facility; and,

iii. on-site storage of PCB waste for disposal.

Situations which are not considered reasonable worst case situations are a double tornado, a terrorist attack, a nuclear strike, a plane crash into the facility, a meteor strike, and damage from an earthquake when there is not an active major geological fault near enough to expect major plant facility damage and release of PCB material.

(3) Public Participation

The RA shall determine whether public participation shall take the form of a public notice only or public notice followed by a 30-day comment period with public review of appropriate permit related documents such as (the sanitized non-confidential business information permit application, any existing PCB disposal permit, any existing draft revised PCB disposal permit, and the Site Evaluation). The notice shall also advise that, if EPA determines that there is sufficient public interest, a public meeting will be held on a specified date and time and at a specified place not more than 45 days after the initial public notice.

After Maxymillian has given the EPA regional office, the state agency, and the local jurisdiction a notice of intent to operate at a site for at least 180 consecutive days or more, and once OPPT and the local EPA region are satisfied that the Site Evaluation meets the requirements set forth in paragraphs 1.d(1) and 1.d(2) above, a 180-day public notification and review process shall begin.

Based on the comments and questions received during the 30-day comment period, the EPA region will determine whether a public meeting is necessary. The public meeting shall be held: (a) to discuss comments made by the public during the 30-day comment period and notification for the public meeting; (b) to allow the public to make comments on the proposed operations and facility; and (c) to allow the public to ask questions of EPA representatives on the proposed operations.

The public meeting will be hosted by the EPA region. OPPT and the EPA region may collectively determine what the schedule and the agenda for the public meeting shall be.

Not more than 150 days after the close of the public comment period, EPA shall make a decision on the authorization of Permanent Operations and on what additional conditions, if any, shall be imposed on the Maxymillian Permanent Operations. The decision will be based on review of comments during the 30-day comment period and comments made during the public meeting. The decision could be that Maxymillian may begin operations without additional permit conditions, or the decision could be made to require additional site-specific permit conditions which must be met before Permanent PCB Disposal Operations may begin at the facility.

2. Feedstock Restrictions: The Maxymillian IDS mobile unit is restricted to treating soil contaminated with PCBs. EPA limits Maxymillian to a feed rate of no more than 12.5 tons per hour and PCB concentration of 700 ppm PCBs. For soil containing levels of PCBs greater than 700 ppm PCBs, the PCB feed rate (pure weight) shall not exceed 61.0 pounds per hour, the soil feed rate not to exceed 12.5 tons per hour. The soil PCB concentration shall not exceed 4000 ppm PCB.

Prior to treatment, the PCBs must be characterized for Aroclor type and concentration. The PCBs must be sampled and analyzed by gas chromatography for PCBs in accordance with the Maxymillian demonstration plan and procedures published by EPA:

"Guidelines for PCB Destruction Permit Applications and Demonstration Test Plans for PCB Incinerators,"
May 28, 1986;

Quality Assurance and Quality Control Procedures for Demonstrating PCB Destruction in Filing for an EPA Disposal Permit," USEPA, June 28, 1983 (Draft);

"Recommended Analytical Requirements for PCB Data Generated On Site During Non-Thermal PCB Destruction Tests", USEPA, March 19, 1986 (Draft); and

"Interim Guidelines and Specifications for Preparing Quality Assurance Plans", QAMS-005/80, Office of Research and Development, USEPA, December 29, 1980.

Authorized EPA representatives must witness this demonstration and obtain appropriate split samples for verification of analytical results. Maxymillian may conduct whatever additional analyses are necessary to characterize the waste feed and facilitate more efficient treatment (i.e., chloride content, ash content and heat of combustion/formation).

3. Operating Conditions and Restrictions:

a. Site-Specific Conditions.

(1) Carbon Adsorption Units Replacement Frequency:

A. Lead Carbon Units: Prior to start up of operations, Maxymillian must characterize each site: (i) for organic compounds including hazardous air pollutants (CAA Sect. 112), and hazardous waste constituents (40CFR 261) (see FOREWORD for applicability), and (ii) to include vegetation, for Total Organic Carbon (TOC) using Method 451.1 or an equivalent method. Maxymillian shall use the results of this characterization to estimate the frequency of adsorptive carbon replacement for the vapor phase carbon units. Carbon replacement frequency must be estimated using procedures submitted by Maxymillian on July 6, 1998, entitled "Vapor Phase Carbon Usage Model for Maxymillian Technologies Indirect Thermal Desorber, July 1998.". Maxymillian must maintain on site a copy of this document for review by regulators whenever operating the IDS.

B. Polishing Carbon Unit: Prior to starting operations at a new site, Maxymillian must load the Polishing Carbon Unit container with fresh, new or regenerated adsorptive carbon material. Carbon loading procedures developed and documented by Maxymillian shall be followed when loading carbon containers.

C. Documentation: Documents used in estimating the frequency of change out of the carbon adsorption units and the results of the soil treatment temperature tests shall be compiled and made available for viewing by agency and regulatory personnel.

(2) Soil Treatment Temperature: At each site, following completion of the shakedown phase, but prior to initiating "production" operations, Maxymillian shall perform a series of tests to determine the temperature at the exit of the desorption unit. The exit temperature is a measure of the effectiveness in the removal of PCBs from soil. Testing shall continue until results from three consecutive tests are acceptable. Treated soil from tests which were unacceptable shall be disposed of in EPA-approved facilities or reprocessed in the Maxymillian IDS.

Operating conditions for these tests shall follow the provisions below:

A. Source of the soil for the tests shall be from a stockpile or areal location containing the highest PCB levels at the site. Test soil shall not have been treated or additives (except for water) added prior to the tests.

B. Tests shall be a minimum of four hours in duration.

C. Samples for each test shall be collected once every 15 minutes minimum and composited.

D. Analytical results from the composite samples shall be less than 2 ppm PCBs to be acceptable.

E. The average of the mean temperatures from the three acceptable tests measured at the exit of the desorption unit shall be computed. This average shall be the soil treatment temperature to be used in treating soil at this site.

F. Maxymillian will divert and segregate the treated soil discharge stream whenever the soil exit temperature descends to 100°F lower than and below the soil treatment temperature, with a five-minute delay. Maxymillian shall divert and segregate the treated soil discharge stream whenever the 60-minute soil exit temperature rolling average descend to and 70°F below the soil treatment temperature, with a 2-minute delay. This material must be stored in an appropriate manner and reprocessed through the IDS until process operations have indicated complete removal of PCBs (less than 2 ppm) or disposed of in an approved chemical waste landfill. A visual and audible alarm will activate at 60°F below the soil treatement temperature.

G. A confirmatory sample, a one-hour composite, shall be collected for analysis whenever significant rainfall occurs (for example: two-inches of rain during a 24-

hour period or a 48-hour continues heavy rainfall). Periods of dry weather requires confirmatory sampling (for example: for stockpiles, a two-weeks dry period or for ground soil, a four-week dry period). Covered stockpiles are exempt from this condition.

b. Operating Conditions and Interlocks.

Operation of the Maymillian Indirect System (IDS) is subject to the conditions expressed herein, and consistent with the materials and data included in Maxymillian's application submitted to NPCD entitled "Operating Permit Application" and "Demonstration Test Plan" submitted December 15, and February 15, 1996 for a TSCA PCB disposal demonstration tests and operating permit; "Operating Permit Application" updated July 11, 1997 and "Demonstration Test Plan" dated July 11, 1997; and "Demonstration Test Report of Maxymillian Technologies. Inc. AAG Fairgrounds Avenue Soil Stockpile Remediation, North Adams, Massachusetts" dated January 8, 1998 and "Demonstration Test Report of Maxymillian Technologies, Inc. Indirect Thermal Desorber, AAG Fairgrounds Avenue Soil Pile 2, North Adams, Massachusetts" dated April 6, 1999.

(1) Regulatory Interlocks: Feed to the IDS shall immediately be shut off automatically or manually following operating procedures for:

A. Failure of the monitoring operations specified in Condition 6, with the exception of Condition 7.a., 6.b., 6.c., 6.g. and 6.h.

B. Failure of the recording equipment monitoring the PCB feed rate and quantity measuring and recording equipment failing as specified in Condition 6.a, must be immediately replaced by manual recording of the PCB feed rate.

(2) Operating Conditions and Operational Interlocks: Maxymillian shall operate the IDS under the following conditions (see Table A) whenever PCBs are being treated:

A. Soil Feed Rate: The set point for feeding of soil shall be 12.5 tons/hour. On a 60-minute rolling average, the soil feed rate shall be 12.5 tons/hr. Based on a 60-minute rolling average, an AWFCO shall be established at 14.5 tons/hr with a 10-sec time delay. On the instantaneous feed rate or the rate of change in feed, an automatic waste feed cut off (AWFCO) or manually-activated waste feed cut off (MWFCO) shall be set for the rate of change in feed at 15 tons/hour with a 5 minute delay.

B. Primary Carbon Adsorption Units: Applying Exhibit 1, Maxymillian IDS Carbon Bed Operating Temperatures, the Primary Carbon Lead Adsorption Unit shall be held below 50% Relative Humidity by maintaining the carbon bed temperature at or above those in Column D and corresponding to a condenser

temperature in Column C. Examples: For a Condenser Exit Temperature of 48°F (Column C), the Carbon Bed Temperature must be a minimum of 57°F (Column D); and for a Condenser Exit Temperature of 60°F, the Carbon Bed Temperature must be at least 72°F.

Operators shall monitor and record hourly the carbon bed and condenser temperatures. An AWFCO or a MWFCO (manual feed cut off) is imposed whenever temperatures in Column D is below that for a corresponding temperature in Column C, with a 60-minute delay. The MWFCO procedure is defined in the Maxymillian SOP. A audio alarm shall be a part of the feed cut off system connected to the condenser temperature and set to activate at rate of changes larger than 2°F per minute.

C. Polishing, Final Carbon Adsorption Unit: Applying Exhibit 1, Maxymillian IDS Carbon Bed Operating Temperatures, the Final or Polishing Carbon Adsorption Unit shall be held below 20% Relative Humidity for Carbon Bed Temperatures above 70°F, 30% R.H. between 70°F and 60°F, and 50% below 60°F. The carbon bed temperatures shall be maintained at or above those in Column B, corresponding to a condenser temperature in Column A. There is a discontinuity in the Carbon Bed Temperatures (Column B) between 60°F and 70°F because of a transition in the relative humidity between 20% R.H. requirement at higher bed temperatures and 50% R.H. requirement at lower bed temperatures. For example, at a Condenser Exit Temperature of 46°F (Column A), the required Carbon Bed Temperature is 55°F minimum (Column B). But at a Condenser Exit Temperature only one degree higher (47°F) the Carbon Bed Temperature must be 61°F, or six degrees higher. The same gap occurs at condenser temperatures of 49°F (bed-65°F) and 50°F (bed-70°F). Operators shall monitor and record hourly the carbon bed and condenser temperatures.

An AWFCO or a MWFCO is imposed whenever temperatures in Column B is below that for a corresponding temperature in Column A, with a 60-minute delay. The MWFCO procedure is defined in the Maxymillian SOP. An audio alarm shall be a part of the feed cut off system connected to the condenser temperature and set to activate at rate of changes larger than 2°F per minute.

D. Primary and Polishing Carbon Units: An AWFCO or a MWFCO (manual feed cut off) with a 5-minute delay is imposed whenever temperatures in Column B is below that for a corresponding temperature in Column A in the Polishing Carbon Unit concurrently with temperatures in Column D is below that for a corresponding temperature in Column C in the Primary Carbon Unit.

E. Operating Pressure: The target Thermal Desorber Face pressure is -0.50" wc (water column) nominally, with a 5-minute delay shutdown at -0.10" wc and a 10-second shutdown at 0" wc (see Table A). Maxymillian must maintain a negative draft throughout the system sufficient to preclude fugitive emissions from the treatment chambers.

F. Oxygen Level: Oxygen emission (O_2) levels shall vary from site to site and within the site according to types and levels of organic chemicals and biota. Soil chemistry may also affect oxygen levels through pyrolytic and degradation reactions of the organic chemicals and biota.

G. Carbon Monoxide Level: Carbon monoxide (CO) emission levels shall vary from site to site and within the site according to types and levels of organic chemicals and biota. Soil chemistry may also affect oxygen levels through pyrolytic and degradation reactions of the organic chemicals and biota. Maxymillian shall comply with local and regional CO emission standards.

H. Induced Draft Fan: Malfunction of the IDS shall activate an AWFCO or a MWFCO with a 10-sec delay or a MWFCO.

I. Combustion Air: Failure of rotary blowers to primary combustion air shall activate an audio alarm and a AWFCO with a 5-minute delay or a MWFCO with a 5-minute delay.

J. Quench Sump pH: Quench sump Ph below 4.0 will activate an AWFCO with twenty minute delay.

K. PCB DRE Requirement: Whenever stack sampling is required, analysis must indicate that the destruction and removal efficiency (DRE) for PCBs in the IDS system shall be a minimum of 99.9999% calculated as follows:

$$\text{DRE} = 100 \times \frac{\text{PCB Feed Rate In, lb/hr} - \text{PCB Stack Emissions, lb/hr}}{\text{PCB Feed Rate In, lb/hr}}$$

where PCB Feed Rate In = Feed Rate X PCB concentration; and
PCB Stack Emissions = Stack Gas Volume Rate X PCB concentration

J. HCl & Particulate Matter: The particulate emission rate shall be less than 0.08 grains/dscf using the procedure given in 40 CFR 264.343 (c). The HCl emissions shall be the greater quantity of 4 pounds per hour or one percent of the HCl entering the pollution control system.

K Dioxins and Furans: Tentative criterion for emission concentration for polychlorodibenzodioxins and polychlorodibenzofurans (PCDD/PCDFs) is 1 ng/dscm expressed in toxic equivalent quotient (TEQ) of the congener 2,3,7,8-tetrachlorodibenzodioxin.

EXHIBIT 1

MAXYMILLIAN IDS CARBON BED OPERATING TEMPERATURES

POLISHING CARBON UNIT		PRIMARY LEAD CARBON UNIT	
A	B	C	D
Condenser Exit Temp.°F	Minimum Carbon Bed Temp.°F	Condenser Exit Temp.°F	Minimum Carbon Bed Temp.°F
32	38	32	38
33	39	33	39
34	41	34	41
35	42	35	42
36	43	36	43
37	45	37	45
38	46	38	46
39	47	39	47
40	48	40	48
41	49	41	49
42	50	42	50
43	51	43	51
44	53	44	53
45	54	45	54
46	55	46	55
47	61	47	56
48	63	48	57
49	65	49	58
50	70	50	60
51	71	51	61
52	73	52	62
53	75	53	63
54	76	54	64
55	78	55	66
56	79	56	67
57	81	57	69
58	83	58	70
59	84	59	71
60	86	60	72
61	88	61	73
62	89	62	74
63	90	63	75
64	92	64	77
65	93	65	78
66	95	66	79
67	97	67	80
68	98	68	82
69	100	69	83
70	101	70	84
71	103	71	85
72	104	72	86
73	106	73	88
74	107	74	88
75	109	75	90
76	111	76	91
77	112	77	92
78	114	78	93
79	115	79	95
80	117	80	96
81	119	81	97
82	120	82	98
83	122	83	99
84	123	84	101
85	124	85	102
86	127	86	103
87	128	87	104
88	129	88	106

TABLE A
MAXYMILLIAN IDS OPERATING SET POINTS AND INTERLOCKS

PARAMETERS	OPERATING SET POINT	INTERLOCK LIMIT OR CONDITION	INTERLOCK ACTION	TIME DELAY	NOTES
Monitor per Cond 6 except 6a.,b.,c., & g.	Functioning	Malfunction	MWFCO	3 min.	
Record PCB feed	Functioning	Malfunction	MWFCO	3 min.	
Primary Carbon Adsorption Units, Carbon Replacement Frequency	Site specific	N/A	N/A	N/A	See Condition 3.b(2)C
Polishing Carbon Adsorption Unit, Carbon Replacement Frequency	Site specific	N/A	N/A	N/A	New charge at new site; See Condition 3.b(2)C
Soil Treatment Exit Temperature (Real Time)	Site specific	100°F below Site Specific Soil Exit Temperature	Divert and Segregate Treated Soil	5 min.	See Condition 3.a(2)
Soil Treatment Exit Temperature (60-minute Rolling Time)	Site specific	70°F below Site Specific Soil Exit Temperature	Divert and Segregate Treated Soil	2 min.	See Condition 3.a(2)
Soil Feed Rate, Average (Real Time)	12.5 tons/hr	15.0 tons/hr	AWFCO	5 min.	
Soil Feed Rate, (60-min Rolling Average)	12.5 tons/hr	14.5 tons /hr	AWFCO	10 sec.	
Primary Carbon Adsorption Units, Relative Humidity	< 50% R.H.	≥ 50% R.H. w. 60-min delay (Column A)	MWFCO		See Exhibit 1
Polishing, Final Carbon Adsorption Unit, Relative Humidity	<20% R.H. @ ≥ 70°F	≥ 20% R.H. (Column B)	MWFCO	60 min.	See Exhibit 1
	<30% R.H. @ ≥ 61°F	≥ 30% R.H. (Column B)	MWFCO	60 min.	See Exhibit 1
	<50% R.H. @ ≤ 60°F	≥ 50% R.H. (Column B)	MWFCO	60 min.	See Exhibit 1
Primary and Polishing Carbon Units Concurrently out of Specified Conditions		~~Primary: ≥ 50% R.H.(Column A)~~.. Polishing: ≥ 20% R.H. (Col. B); ≥ 30% R.H. (Col. B); ≥ 50%R.H. (Col. B)	MWFCO	5 min.	
Thermal Desorber Face Pressure	< - 0.5 inches w.c.	≥ - 0.10 inches w.c.	AWFCO	5 min.	
	< -0.5 inches w.c.	≥ 0.0 inches w.c.	AWFCO	10 sec	
Scrubber pH	6.0 - 8.0	< 4.0	AWFCO	20 min.	
Exhaust O2, %, vol., dry	Site specific	See Condition 3.b(E)			See Condition 3.b(E)
Exhaust Gas CO, ppm, vol., dry	Site specific	See Condition 3.b(F)			See Condition 3.b(F)
I.D. Fan	Functioning	Malfunction	AWFCO or MWFCO	10 sec.	See Condition 3.b(G)
Combustion Air	Blower Functioning	Malfunction	AWFCO or MWFCO	5 min.	

4. Analysis of Process Material and Residues: The following requirements (Condition 4) do not apply if the process residues are disposed of in EPA-approved facilities, including chemical waste landfills and Subtitle C landfills.

Representative samples of the treated material from each shift (12 hr.) operation must be collected and analyzed in duplicate (i.e., duplicate analysis) by gas chromatography for PCB concentrations. Any treated soil that is discovered to contain greater than 2 ppm PCB must be handled as if it contained the original concentration of PCBs of soil feed prior to processing. This material must be stored in an appropriate manner and reprocessed through the IDS until process operations have indicated complete removal of PCBs (less than 2 ppm) or disposed of in an approved chemical waste landfill.

Waste material include spent carbon filter media (both vapor and liquid phase), gas and liquid filter sludge and personnel protective equipment. All process solid waste exhibiting a level of PCB above 2 ppm chromatographic peak and aqueous waste above 3 ppb PCBs must be disposed of as if it contained the PCB level of the feedstock.

Treated Water Effluent must be confirmed to be below 3 ppb PCBs prior to discharge to an EPA- or agency- permitted outlet stream, or prior to applying to treated soil to preclude dusting.

Should sampling of treated material or residue be required for polychlorinated dibenzodioxins and polychlorinated dibenzofurans (including 2,3,7,8-tetrachlorodibenzodioxins (TCDDs) and 2,3,7,8-tetrachlorodibenzofurans (TCDFs)) the analysis must be accomplished using laboratory techniques with detectable limits below 0.2 parts per billion (ppb).

Analytical Methods: The chemical analysis of PCBs requires use of gas chromatography. Any gas chromatographic method that is appropriate for the material being analyzed may be used, including EPA Method 608, "Organochlorine Pesticides and PCBs" at 40 CFR part 136, Appendix A;" EPA Method 8082, "Polychlorinated Biphenyls (PCBs) by Capillary Column Gas Chromatography" of SW-846, "OSW Test Methods for Evaluating Solid Waste," which is available from NTIS, and ASTM Standard D-4059, "Standard Test Method for Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography," which is available from ASTM..

5. Desorber Failure: If the quality control testing, as described below and in Conditions 4, reveals that after the first five composite samples (i.e. the first 40 hours of operation) that the IDS has not been able to achieve the required less than 2 ppm PCB residue in treated soil at the same time, then Maxymillian must stop operations with the IDS. The facility operator must notify the Fibers and Organics Branch (202) 260- 3933 or by FAX at (202) 260-1724 during the business hours in Washington, D.C. and the EPA Regional Office on the day of the major system failure or, if failure does not occur during business hours, during the next regular business day, and file a written report within fifteen (15) days. The affected unit shall not resume operation until the problem has been corrected to the satisfaction of the EPA.

6. Monitoring and Recording: Provisions must be made to assure that the following process elements are suitably monitored and recorded for all PCBs processed, such that materials harmful to health or the environment are not inadvertently released:

a. quantity of PCB contained in feed soil and concentration of PCBs and other raw materials (i.e., feedstock and chemical reagents) fed into the IDS system;

b. the rate and quantity of PCBs (feed rate times the PCB concentration) fed shall be measured and recorded at least every 15 minutes;

c. quantity and concentration of PCBs in the treated material, including process wastes (the method of disposal and location of the disposal facility for each waste should be documented) (see Condition 4 for applicable conditions);

d. temperature and pressure of desorption at least once during every half-hour interval;

e. the desorber soil exit temperature shall be continuously measured and recorded,

f. date, time and duration of each operation, and

g. name, address, and EPA identification number of the facility.

The records must be compiled and maintained in accordance with the time(s) and location(s) specified in Condition 17.

7. Annual Quality Control Monitoring: Upon request from EPA, Maxymillian shall conduct annual monitoring of the facility for PCBs destruction and removal efficiencies and HCl removal efficiency, and mass emission rates for particulates, 2,3,7,8-tetrachlorodibenzodioxin (TCDD), and 2,3,7,8-tetrachlorodizenzofuran (TCDF) and total polychlorinated dibenzodioxins and total polychlorinated dibenzofurans. This annual monitoring must be consistent with procedures outlined in SW-846, and may be part of an air permit compliance demonstration such as a State Air Permit. If the limits specified in the Conditions of Approval are not complied with, U.S. EPA must be notified within one day of receipt of the test results, and Maxymillian shall cease PCB disposal operations. If no disposal operations were conducted during the year of an anniversary of this permit, EPA may request monitoring during the first disposal operation in the following year after the anniversary. All parameters shall be monitored as required under this condition.

8. PCB Releases: In the event Maxymillian believes, or has reason to believe, that a fugitive release of PCBs other than stack gas emission has or might have occurred from the unit during processing, the facility operator must inform the appropriate EPA Regional Administrator or PCB Coordinator by phone immediately after remedial actions have been taken to ensure the protection of health and the environment.

A written report describing the incident must be submitted by the fifteenth (15th) business days after the day of the incident. No PCBs may be processed in that facility until the release problem has been corrected to the satisfaction of the EPA.

9. Spills: Any spills of PCBs or other fluids shall be promptly controlled and cleaned up as provided in the Spill Prevention, Control and Countermeasures Plan provided in the application and trial burn plan. In addition, a written report describing the spill, operations involved, cleanup actions and changes in operation to prevent such spills in the future must be submitted to the appropriate EPA Regional Administrator within fifteen (15) business days. PCB spills must be reported in accordance with the PCB spill reporting requirements prescribed under Section 311 of the Clean Water Act for discharges to navigable waters and under the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund) for discharges to other media.

10. Safety and Health: Maxymillian must take all necessary precautionary measures to ensure that operation of the IDS is in compliance with the applicable safety and health standards, as required by Federal, State and local laws and regulations and ordinances. Any lost-time injury occurring as a result of the operation of the IDS must be reported to the PCB Disposal Site Coordinator in the appropriate EPA Regional Administrator by the next business day. A written report describing the accident must also be submitted within five business days.

11. Facility Security: The facility shall be secured (e.g., fence, alarm system, etc.) to ensure that only those individuals participating in the operations are allowed in the area.

12. Incident Notification: Any notification to an EPA Regional Administrator required by conditions (9), (10), and (11) shall also be made by telephone to the Fibers and Organics Branch at (202)-260-3933 within the time frame specified. In addition, Maxymillian shall file a written report with the Director of the Office of Pollution Prevention and Toxics, Office of Prevention Pesticides and Toxic Substances, 401 M Street S.W., Washington, D. C. 20460 within the time frame specified.

13. Waste Disposition: Process waste such as filter sludge must be disposed of as PCB waste pursuant to 40 CFR 761 unless it is established through representative sampling that the material contains levels of PCBs less than 2 ppm by individual congeners or less than 2 ppm total PCB the analytical chromatogram indicates Aroclor patterns. PCB-contaminated equipment on the Maxymillian unit may be transferred off-site only in accordance with the U.S. Department of Transportation (DOT) requirements at 49 CFR Part 172. Such requirements include placarding the equipment if the unit is not decontaminated after use.

14. Agency Approvals/Permits: No operation may commence until Maxymillian has obtained all necessary approvals/permits from Federal, State and local agencies. Maxymillian is responsible for obtaining such approvals/permits.

15. Personnel Training: Maxymillian shall be responsible for ensuring that personnel directly involved with the handling or disposal of PCB-contaminated soil using the IDS unit are demonstrably familiar with the general requirements of this approval. At a minimum, the general requirements must include:

a. the disposal of solid PCBs which may be treated using the IDS, and the expected upper limit of PCB contamination which may be treated;

b. basic recordkeeping requirements under this approval and the location of records;

c. notification requirements;

d. waste disposal requirements for process and by-product wastes generated during the operation of the IDS;

e. safety, operation, and maintenance procedures;

f. procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment;

g. spill prevention and cleanup plan; and

h. reporting requirements.

In this regard, Maxymillian must maintain on-site during the operations of its unit a copy of this approval; the Spill Prevention, Control and Countermeasure plan; and sampling and analytical procedures, as Condition 4 requires, used to determine PCB concentrations in soil. In addition, a copy of the sampling and analytical procedures must be maintained in the laboratory conducting the analysis.

16. Financial Assurance: Maxymillian shall incorporate financial assurance of closure and liability coverage provisions into its closure plan. These provisions must be equivalent to those specified in 40 CFR Part 264, Subpart H of the Resource Conservation and Recovery Act (RCRA), and provide funds for proper closure of the mobile PCB disposal units and support operations including all PCB storage facilities.

Before Maxymillian starts permitted operations at any other facility, Maxymillian must submit in writing site closure financial assurance provisions and documentation of financial assurance for accident liability. These provisions addressing specific sites must be submitted to the Director, National Program Chemicals Division for the Office of Pollution Prevention and Toxics. EPA will review these documents to determine if they are acceptable. EPA will notify Maxymillian of any deficiencies in the closure plan or financial assurance mechanism(s)

Maxymillian must submit in writing annual updates to the Director, National Programs Chemicals Division of the financial assurance of closure and liability coverage provision described herein.

17. Recordkeeping: Maxymillian shall collect and maintain for a period of five years from the date of the demonstration the following information:

a. Continuous and short interval data described below:

(i) Rate and quantity of PCBs fed to the IDS;

(ii) Soil exit temperature;

(iii) Carbon replacement operations, date, time, quantity, and carbon manufacturer and grade.

b. Data and records on the monitoring of desorption efficiency as required by these conditions.

c. A copy of each gas chromatogram, including relevant standards and blanks, from the test required by Conditions 2 and 4.

d. The total weight in kilograms of any solid residues generated by the IDS during operations, and the total weight in kilograms of any solid residues disposed by the facility in chemical waste landfills.

e. The name and address of each client whose PCBs were processed by the IDS.

f. The date(s) time and duration of the operations.

g. The name, address and telephone number of the operator and supervisor.

h. An annual report shall be submitted to U.S. EPA Headquarters and to the appropriate EPA Regional Office by 60 days after each anniversary of the effective date of this permit. The annual report shall include information required in Conditions 17d through 17h. Included in the report shall be the results of monitoring required in Condition 6.

The documents must be compiled within 60 days following completion of the treatment; must be kept at one centralized location; and must be available for inspection by authorized representatives of the EPA upon request. Maxymillian must also maintain the records required by 40 CFR 761.180(f). If Maxymillian terminates operation of the IDS, these records or their copies must be submitted to the Director of the National Program Chemical Division, USEPA.

In addition, Maxymillian must maintain, at the facility, a record of the PCB disposal services performed by the unit during the previous month. Less recent records are to be maintained at a Maxymillian facility. All records must be available for inspection by authorized representatives of EPA.

18. Ownership or Operational Transfer: Maxymillian must notify EPA at least 30 days before transferring ownership or operations responsibility of the Maxymillian PCB Indirect Thermal Desorption Unit(s). Maxymillian must also submit to EPA, at least 30 days before such transfer, a notarized affidavit signed by the transferee which states that the transferee will abide by Maxymillian's EPA approval. It is Maxymillian's responsibility to include in the notification: the name, the address, phone number, and other pertinent information about the transferee. Maxymillian must also submit a report of permitted disposal activities, including quantities and concentrations of PCB materials treated; proof that generated waste have been appropriately disposed; certification that any Maxymillian facilities, where disposal equipment and/or supplies have been kept/maintained, will be appropriately cleaned/removed before the transfer; and a descriptions of exactly what part (equipment and/or operating staff) of Maxymillian will be transferred. In order for the Maxymillian EPA approval to be transferred and prior to conducting any PCB disposal operations, the transferee must provide financial assurance for closure and liability relevant to the type of activities in Maxymillian's approval.

Within thirty days of receiving such notification and affidavit, EPA will issue an amended approval substituting the transferee's name for Maxymillian's name, or may require the transferee to apply for a new PCB disposal approval. In the latter case, the transferee must submit a demonstration test plan for EPA review and upon approval perform a demonstration at a site with materials of PCB concentration proposed by the transferee and approved by EPA. Should Maxymillian and the transferee fail to provide EPA with the required written documentation related to the sale or ownership or operations responsibility transfer and/or to provide this documentation within the specified time frame, this permit shall be null and void.

19. Additional IDS Units: Maxymillian must file a written pre-operation report with the Director for National Program Chemicals Division of the Office of Pollution Prevention and Toxics within thirty (30) days from the date of construction of each additional IDS to be operated in the United States. This report should contain the following information:

a. date of construction the unit;

b. identification of the new IDS unit;

c. certification by an independent, registered professional engineer to the effect that the IDS is substantially identical to the original demonstrated system in terms of engineering design, hardware, process capacity, quality and workmanship;

d. certification by the chief executive officer of Maxymillian Technologies, Inc. signifying that the new IDS system has been completed in such manner; and

e. a list of all non-substantive changes made to the design and construction of the new IDS system which are not identical to the original IDS.

20. Design Modifications: No major modifications may be made to the IDS design, as described in the application and demonstration plan for this approval, without written authorization of the Director of the Office of Pollution Prevention and Toxics. For the purpose of this approval, "major modification" shall be defined as any change to capacity, design, efficiency, waste type, or any other changes affecting overall performance or environmental impact.

Monitoring of stack emission product shall be conducted after the IDS has been modified in any manner which may affect the characteristics of the stack emission products. At a minimum, monitoring shall be conducted for the following parameters:

a. Oxygen, O_2

b. Carbon monoxide, CO

c. Carbon dioxide, CO_2

d. Hydrochloric acid, HCl

e. Total particulates matter

f. Total volatile organic content, VOC

g. Total semi-volatile organic content, SVOC

h. Total PCDD/PCDFs as TEQ 2,3,7,8-TCDD.

i. PCBs

21. Approval Severability: The conditions of this approval are severable, and if any provision of this approval or any application of any provision is held invalid, the remainder of this approval shall not be affected thereby.

22. Approval Effective Date: This approval shall expire five calendar years from the date the permit becomes effective. For an approval renewal, EPA may require additional information and/or testing of the IDS. In order to continue the effectiveness of this approval pending EPA action on reissuance, Maxymillian must submit a renewal request letter to EPA at least 90 calendar days, but not more than 180 calendar days, prior to the expiration date of this approval.

APPROVAL

1. Approval to dispose of PCBs is hereby granted to Maxymillian Technologies, Inc. (Maxymillian) of Pittsfield, Massachusetts, subject to the conditions expressed herein, and consistent with the materials and data included in the permit application filed by the company. EPA reserves the right to impose additional conditions when it has reason to believe that the continued operation of the IDS unit presents an unreasonable risk of injury to health or the environment. Any such proposed additional conditions shall be preceded by reasonable advance notice to Maxymillian and opportunity for Maxymillian to comment on the proposed modifications.

Any departure from the conditions of this approval or the terms expressed in the application must receive prior written authorization of the Director, National Program Chemicals Division, Office of Pollution Prevention and Toxics, USEPA. In this context, "application" shall be defined as all data and materials which have been received by this Agency from Maxymillian regarding the IDS.

2. This approval to dispose of PCBs does not relieve Maxymillian of the responsibility to determine and comply with all applicable Federal, State and local laws and regulations. Violations of any applicable regulations will be subject to enforcement action, and may result in termination of this approval. This approval may be modified or terminated at any time for failure to comply with the terms and conditions herein, failure to disclose all relevant facts, or for any other reasons which the Director, National Program Chemicals Division deems necessary to protect health or the environment.

3. Maxymillian shall be responsible for the actions of any authorized IDS employees when those actions are within the scope of operating or moving the Process, and shall assume full responsibility for compliance with all applicable Federal, State and local laws and regulations including, but not limited to, any advance or emergency notification and accident reporting requirements.

4. EPA reserves the right for its employees or agents to inspect the IDS and PCB disposal activities at any location or reasonable time.

9/27/99
Date

John W. Melone, Director
National Program Chemicals Division

MAXYMILLIAN INDIRECT SOURCE THERMAL DESORPTION SYSTEM (IDS)

BACKGROUND

Section 6(e)(1)(A) of the Toxic Substances Control Act (TSCA) requires that EPA promulgate rules for the disposal of polychlorinated biphenyls (PCBs). The rules implementing section 6(e)(1)(A) were published in the Federal Register of May 31, 1979 (44 FR 31514) and recodified in the Federal Register of May 6, 1982 (47 FR 19527). Those rules require, among other things, that various types of PCBs and PCB Articles be disposed of in EPA-approved landfills (40 CFR 761.75), incinerators (40 CFR 761.70), high efficiency boilers (40 CFR 761.60), or by alternative methods (40 CFR 761.60(e)) that demonstrate a level of performance equivalent to EPA-approved incinerators or high efficiency boilers. The May 31, 1979 Federal Register also designated Regional Administrators as the approval authority for PCB disposal facilities.

On March 30, 1983, EPA issued a procedural rule amendment to the PCB rule (48 FR 13185). This procedural rule change transferred the review and approval authority of mobile and other PCB disposal facilities that are used in more than one region to the Office of Prevention Pesticides and Toxic Substances (OPPTS). The purpose of the amendment is to eliminate duplication of effort in the regional offices and to unify the Agency's approach to PCB disposal. The amendment gives the Assistant Administrator authority to issue nationwide approvals (i.e., approvals which will be effective in all ten EPA regions) to mobile and other PCB disposal facilities that are used in more than one region. The authority was subsequently delegated to the Director, National Programs Chemical Division.

Maxymillian Technologies, Inc. (Maxymillian), headquartered in Pittsfield, Massachusetts with a branch office in Boston, Massachusetts, provides commercial hazardous waste remediation services to public customers using its proprietary Indirect System (IDS). The IDS process uses an alternate technology as a mobile treatment unit for hazardous waste including PCBs. Maxymillian initially submitted their TSCA (Toxic Substances Control Act) R&D Permit Application to the U.S. Environmental Protection Agency (EPA) in 1995, EPA granting the R&D approval later that year. The TSCA Permit Application (operating permit) and Demonstration Test Plans were submitted December 1995. Maxymillian demonstrated the IDS at a remedial site managed by the General Electric Company and located at the South Glens Falls Drag Strip, Moreau, New York. The demonstration was performed during the periods from May 29th to 31st, 1996 and on August 23, 1996. Results of R&D studies and Demonstration Tests at the South Glen Falls Drag Strip are summarized in Appendix III.

After the South Glen Falls demonstration, Maxymillian modified the IDS extensively. The company submitted revisions of the TSCA Permit Application and the Demonstration Test Plan on July 11, 1997, describing the modifications. The site selected for demonstrating the IDS was a remedial site with oversight responsibilities by the Massachusetts Department of Environmental Protection (MA DEP), the Fairground Avenue Stockpile Remediation site, located in North Adams, Massachusetts. The American Annuities Group (AAG) was the Potential Responsible Party (PRP). EPA reviewed the "Release Abatement Measure Plan" submitted to the

MA DEP dated June 25, 1997 and determined the Plan was acceptable. Maxymillian performed the PCB Disposal Demonstration during the period from September 16 to September 19, 1997. Results of the demonstrations are summarized in Appendix III.

In 1999, the MA DEP determined that the AAG site required additional remedial activity. Soil containing high PCB levels required Maxymillian to demonstrate the effectiveness of the IDS to treat soil at the high PCB concentration. Maxymillian conducted the demonstration to amend their TSCA approval at the AAG Fairgrounds Avenue Stockpile Site in North Adams, Massachusetts on March 25 and 26, 1999. Results of the demonstration is summarized in Appendix II.

FINDINGS

1. The Maxymillian Indirect System is a mobile treatment unit to dispose of non-liquid PCBs. The IDS removes PCBs from contaminated soil. Components of the IDS include the following

a. Material feed system;
b. Indirectly heated desorber;
c. Baghouse;
d. Materials discharge system;
e. Vapor treatment system; and
f. Liquid treatment system.

Process Description: The IDS employs a continuous process starting with the loading of contaminated soil into the material feed system. The IDS which uses a rotary desorption chamber is heated by an indirect source to desorb organic contaminants from soil. Maxymillian claims that a non-oxidative atmosphere is maintained throughout the desorption chamber. The gas stream from the desorber passes through a baghouse where particulate is separated from the gas stream and discharged along with the treated soil from the desorption chamber. The gas stream is quenched, inducing desorbed contaminants to condense and to separate from the gas stream. Water from the quench sump is pumped to the liquid treatment system.

A series of condensers, coalescer, filters and carbon adsorption beds further cleanses the gas stream. The gas then passes through a set of polishing carbon beds prior to discharging to the atmosphere. An alternate polishing procedure may be utilized where the gas stream flows through the polishing carbon bed, to the indirect heating chambers, where the light hydrocarbons which are not adsorbed by the carbon beds are destroyed.

Quench sump water and condensate from the gas treatment system combine and are stored in a holding tank. The Liquid Treatment System treats this water though pH adjustment and flocculation. As the water flows through a clarifier, material which settle out are pumped to a filter press. the filtrate is pumped back to the flucculator. Water exiting the clarifier flows through dual particulate filters and finally through polishing carbon adsorption columns. The purified water is pumped to the treated soil discharge system for cooling and remoisturization of the soil.

2. The Maxymillian Indirect System mobile unit is designated as an alternate PCB disposal method or more appropriately, an alternate PCB thermal disposal process. The Maxymillian IDS mobile unit has demonstrated PCB disposal equivalent to a 40 CFR 761.70 incinerator. Incinerators meeting these criteria have been shown not to present an unreasonable risk to human health or the environment. The currently accepted performance level for EPA-approved incinerators is 99.9999% destruction and removal efficiency (DRE) for PCBs.

3. Many of the IDS unit operating parameters are computer controlled. Should a malfunction occur, the IDS unit is designed to automatically shut down. In addition, a shutdown sequence may be initiated by manual activation.

4. Due to the design aspects, operating parameters, and safety measures, EPA finds that operation of the Maxymillian IDS system is equivalent to operation of a 40 CFR 761.70 incinerator and does not pose an unreasonable risk of injury to health or the environment.

5. PCDD/PCDF Emissions Criteria: When Maxymillian submitted applications for TSCA PCB R&D and nationwide approvals, the proposed emission standard for PCDD/PCDF by hazardous waste incinerators was at the 1 ng/m^3 level. Since then, several changes have been proposed. Current proposed level (6/30/97) is 0.2 ng/m^3. Because a significant number of facilities exists throughout the country which can be categorized as small incineration facilities, a potential option for separate, parallel standards for small facilities is being considered. The dividing line between small and medium facilities is set at 20,000 acfm. Because the Maxymillian exhaust gas flow is about two orders of magnitude smaller than the dividing line, EPA believes it is premature to impose the current proposed PCDD/PCDF emission standard for hazardous waste incinerators until the options for separate standards for small incinerators are further developed.

6. Carbon Adsorption Columns: Organic material in soil when thermally desorbed enter the gas stream. These compounds are removed from the gas stream primarily in the quenching cycle, 0with the quench water being pumped to the water treatment unit. A condenser removes a large portion of the organic compounds remaining in the gas stream. The condensate is pumped to the water treatment unit. The water treatment unit removes the organic contaminants, including PCBs, to regulatorily acceptable levels. The organic vapors remaining in the gas stream is removed by activated carbon adsorption. For carbon adsorption media to be effective, the gas stream must remain at low relative humidity (R.H.). EPA believes that 50% relative humidity maintains adsorptive effectiveness. For the primary vapor phase carbon units, EPA has imposed a 50% R.H. limit. Adsorptive effectiveness is also affected by temperature, i.e., high temperatures diminish effectiveness. Therefore, for the polishing vapor phase adsorptive unit, EPA imposes a 20% R.H. limit at temperatures 70°F and higher, a transition segment of 30% R.H. from 70°F to 61°F and 50% R.H. below 61°F. The condenser exit temperatures and the corresponding carbon bed temperatures which control the relative humidity of the gas stream is presented in Exhibit 1 of this approval. The conditions portrayed in Exhibit 1 is based on psychrometric charts from Perry's "Chemical Engineers' Handbook, 3rd ed., McGraw-Hill, 1950", pp 765-766 and Maxymillian's operating conditions based on relative humidity values presented in Figure A-1. Figure A-1 has been reformatted from Excel to WordPerfect with EPA-revised compliance criteria.

7. Carbon Replacement Frequency. Maxymillian has developed a carbon bed replacement cycle based on the organic content of soil. Because each site will contain varying types and quantity of organic matter, including PCBs, the frequency of carbon replacement will vary depending on the organic composition of soil. Maxymillian's analysis presents a procedure to characterize each site for organic compounds using the Total Organic Carbon (TOC) Method 451.1. EPA believes that further characterization of the soil is necessary including hazardous air pollutants (CAA Sect. 112), and hazardous waste constituents (40CFR 261). Most sites requiring remediation has been characterized by the responsible agency and need not be repeated (see FOREWORD for applicability). Maxymillian must use the results of this analysis to estimate the frequency of carbon replacement for the vapor phase carbon units. The analysis was submitted by Maxymillian on July 6, 1998, and entitled "Vapor Phase Carbon Usage Model for Maxymillian Technologies Indirect Thermal Desorber, July 1998.". Maxymillian must maintain on site a copy of this document for review by regulators whenever operating the IDS. For the Polishing Carbon Unit, EPA believes that loading the Polishing Carbon Unit container with fresh, new adsorptive carbon material at each site provides more than adequate capacity subject to the Lead Carbon Units being maintained as required. Maxymillian developed carbon loading procedures to ensure the integrity of the carbon units.

8. Water Phase Carbon Units. Maxymillian's replacement cycle for the water phase carbon adsorption unit is based on elimination of compounds which cause objectionable odors in the treated water. Thermal desorption of organic matter in soil results in synthesis of compounds with unpleasant odor. Removal of these compounds from the water phase also removes PCBs to below detectable limits (3 ppb). EPA believes the Maxymillian water phase carbon replacement practices impose no unreasonable risk of injury to health and the environment.

9. PCB Disposal Demonstration, 1999: The demonstration was completed on March 25 and 26, 1999. Results of the demonstration were submitted June 2, 1999. Emission sampling results indicated that the IDS, an alternative PCB thermal disposal technology, met or surpassed the standard for PCB disposal incinerators, 99.9999% destruction and removal efficiency (DRE). PCB DREs for two demonstration tests were 99.9999996% and 99.99999992% corresponding with emission rates of 38.1 and 6.50 nanograms/second (ng/sec). Dioxin and furan emission concentrations, expressed as 2,2',4,4'-tetrachlorobiphenyl TEQ (toxic equivalent quotient) ng/dscm (nanogram/dry standard cubic meter), were 2.65E-03 and 3.37E-03 ng/dscm. Emission rates for dioxins and furans were 30.3 and 33.3 picograms/sec TEQ. Treated soil for three test runs were 0.28, 0.49 and 1.18 ppm PCBs.

10. The mobile Maxymillian IDS Unit is designated an alternate PCB disposal method or more appropriately, an alternate PCB thermal treatment process, the Maxymillian IDS Unit equivalent to a 40 CFR 761.70 incinerator.

11. Maxymillian demonstrated the IDS to meet or exceed the operating performance criteria for incineration of non-liquid PCBs under 40 CFR 761.70, as well as the additional criteria noted as Permit Conditions in the TSCA Approval. The currently accepted performance level for EPA-approved incinerators is 99.9999% destruction and removal efficiency (DRE) for PCBs. The Agency has judged that these criteria were met and that the operation of this alternative thermal technology will not present an unreasonable risk to human health or the environment.

FIGURE A-1. RELATIVE HUMIDITY VALUES

PRIMARY COND-DENSER TEMP. °F	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
	VAPOR PHASE CARBON BED TEMPERATURE (DEG F)																																							
32	100	85	71	57	40	30	18	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34		100	85	70	56	40	32	20	15	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36			100	82	70	57	45	36	24	19	11	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38				100	83	70	59	47	38	28	20	15	10	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40					100	87	71	60	51	40	31	23	18	11	8	3	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42						100	86	73	60	50	41	35	27	20	15	10	5	3	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44							100	88	75	62	52	44	36	29	22	17	12	8	5	3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46								100	90	74	65	53	45	38	31	25	20	15	11	8	5	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
48									100	85	78	65	56	47	40	33	28	22	18	15	10	8	5	3	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
50										100	90	78	69	59	47	41	35	30	24	20	16	11	9	6	5	3	1	1	1	1	1	0	0	0	0	0	0	0	0	0
52											100	89	79	69	58	50	42	36	31	28	22	18	15	12	9	8	7	6	5	4	3	1	1	1	1	1	1	0	0	0
54												100	90	78	68	60	52	45	39	33	29	24	20	18	13	11	8	6	5	3	2	2	2	1	1	1	1	1	0	0
56													100	90	79	70	61	54	48	41	36	30	26	22	19	18	12	10	8	6	5	4	2	1	1	1	1	1	1	0
58														100	90	80	70	62	55	49	42	37	32	28	24	21	17	14	12	10	9	7	5	4	3	2	1	1	1	1
60															100	90	80	71	62	58	50	44	39	34	30	26	22	19	16	14	12	10	8	6	5	4	3	2	1	1
62																100	90	80	72	65	58	51	45	40	35	31	28	24	21	18	16	14	11	9	8	7	6	4	3	1
64																	100	90	81	72	65	58	52	47	41	36	32	29	25	23	20	17	15	13	11	9	7	6	5	5
66																		100	90	81	73	66	60	53	48	43	38	34	30	27	24	22	18	16	15	13	11	9	8	7
68																			100	90	81	74	67	60	55	48	44	40	35	31	28	25	23	20	17	15	14	12	11	9
70																		100	91	81	74	68	61	56	50	45	41	37	33	30	27	24	21	19	17	15	14	12		
72																			100	91	82	75	69	63	57	51	47	42	38	35	31	28	25	23	20	18	16	15		
74																						100	91	82	76	70	63	58	52	48	44	39	36	32	28	26	24	22	18	17
76																					100	92	83	76	70	64	58	53	48	44	40	37	33	30	27	25	23	21		
78																					100	91	83	76	70	65	59	54	49	45	41	37	34	31	29	26	24			
80																									100	92	84	77	70	65	60	55	50	46	43	38	35	33	29	27
82																								100	92	85	77	71	66	60	56	51	47	44	39	36	34	31		
84																								100	93	85	78	72	66	61	56	52	48	40	40	38	35			
86																												100	93	85	80	73	68	63	57	53	48	45	41	38
88																													100	94	86	81	74	68	64	58	53	49	46	43

(dark shading) PRIMARY LEAD VESSEL OK
(light shading) POLISHING VESSEL OK

PRIMARY LEAD VESSEL OK
POLISHING VESSEL CORRECT IN 5 MIN OR MANUAL WFC

___ PRIMARY LEAD VESSEL CORRECT IN 5 MIN. OR MANUAL WFC
___ POLISHING VESSEL CORRECT IN 5 MIN OR MANUAL WFC

MANUAL WASTE FEED CUT-OFF (WFC ...MPLIANCE CRITERIA:

PRIM... ...D VESSEL: ALWAYS ≤ 50 % RH OR MANUAL WFC WITH 5 MIN. TIME DELAY

POLISHING VESSEL: IF POLISHING BED < 60 F THEN RH ≤ 50 % OR MANUAL WFC WITH 5 MIN. TIME DELAY
IF POLISHING BED 60-70 F THEN RH ≤ 30 % OR MANUAL WFC WITH 5 MIN. TIME DELAY
IF POLISHING BED > 70 F THEN RH ≤ 20 % OR MANUAL WFC WITH 5 MIN. TIME DELAY

SUMMARY OF RESULTS
FROM THE MAXYMILLIAN TSCA PCB DISPOSAL DEMONSTRATION
AT THE AAG FAIRGROUNDS AVENUE STOCKPILE SITE
IN NORTH ADAMS, MASSACHUSETTS
March 25 & 26, 1999

OPERATING CONDITIONS

Thermal Desorber Operating Data	RUN 1	RUN 2	RUN 3	AVG
Soil Feed Rate, tons/hr	9.31	10.36	8.83	9.5
Soil Exit Temperature °F	683	713	694	694
Thermal Desorber Face Pressure, in. w.c.	-0.17	-0.16	-0.15	-0.16
Quench Water pH	6.95	6.69	6.48	6.70
Primary Vapor Phase Carbon Vessel	0	0	0	0
Relative Humidity, %				
Polishing Vapor Phase Carbon Vessel	0	0	0	0
Relative Humidity, %				

PCBs DRE

Soil PCB Level, ppm (Maxymillian)	4180	3030	3070	3472
Soil Feed Rate, tons/hr	9.31	10.36	8.83	9.5
Total PCB Flow Rate, lb/hr	77.83	62.78	54.21	64.94
PCB Stack Emissions, gm/sec	3.81E-08	6.50E-09	N/A	2.23E-08
PCB DRE, %	99.99999996	99.999999967	N/A	99.999999994

N/A = not applicable

Dioxins/Furans

2,3,7,8 TCDD TEQ Exhaust Gas Concentration, ng/dscm, corrected to 7% O_2	2.65E-03	3.37E-03	N/A	3.01E-03
2,3,7,8 TCDD TEQ Exhaust Gas Emission Rate, gm/sec	3.03E-13	3.33E-13	N/A	3.18E-13

Process Stream Split Samples, PCB Analysis, EPA Lab, ppm PCBs

	RUN 1	RUN 2	RUN 3	Avg
Soil Feed PCB Concentration, ppm	2,361	1,672	3,846	2626
Treated Soil, ppm	< 2	< 2	< 2	< 2
Treated Water, µg/L	2.90	261	266	177

Soil Feed Rate Limit Calculation: Soil PCB concentration shall be the average of Maxymillian and EPA analysis for each separate run. The PCB feed rate limit is calculated by averaging the two tests with the highest PCB feed rates.

	Run 1	Run 2	Run 3
PCB Concentration:	(4180+2361)/2 = 3270.5 ppm	(3030 +1672)/2 = 2366 ppm	(3070 +3846)/2 = 3458 ppm
PCB Feed Rate:	3270.5 X 9.31 T/hr = 60.9 lb/hr	2366 X 10.36 T/hr = 49.0 lb/hr	3458 X 8.83 T/hr = 61.1 lb/hr

Avg. of Runs 1 & 3 = 61 lb/hr PCB

EXHAUST EMISSIONS

Parameters	RUN 1	RUN 2	RUN 3	Avg
Carbon Monoxide, 7% O_2, ppmv	30,000	27,000	N/A	28,500
Carbon Dioxide, vol %	13.4	13.9	N/A	13.7
Oxygen, vol %	4.2	5.4	N/A	4.8

DIOXINS/FURANS

	Run 1			Run 2		
PCDDs,	Concentration ng/dscm	TEQs ng/dscm	TEQ Emission Rate, g/s	Concentration ng/dscm	TEQs ng/dscm	TEQ Emission Rate, g/s
2,3,7,8-TCDD	< 2.34E-03 ND	< 2.34E-03 ND	< 2.23E-13 ND	< 2.71E-03 ND	< 2.71E-03 ND	< 2.40E-13 ND
Other TCDD	0.00E-0			0.00E-00		
Total TCDD	< 1.05E-03 ND			< 1.0 8E-03 ND		
1,2,3,7,8-PeCDD	< 1.05E-03 ND	< 5.23E-04 ND	< 4.99E-14 ND	< 1.05E-03 ND	< 5.25E-04 ND	< 4.66E-14 ND
Other PeCDD	0.00E+00			0.00E+00		
Total PeCDD	< 1.05E-03 ND			< 1.05E-03 ND		
1,2,3,4,7,8-HxCDD	< 1.05E-03 ND	< 1.05E-03 ND	< 9.97E-15 ND	< 1.11E-03 ND	< 1.11E-04 ND	< 9.89E-15 ND
1,2,3,6,7,8-HxCDD	< 8.92E-04 ND	< 8.92E-05 ND	< 8.51E-15 ND	< 1.05E-03	1.05E-04	9.32E-15
1,2,3,7,8,9-HxCDD	< 9.84E-03 ND	< 9.84E-04 ND	< 9.39E-14 ND	< 1.40E-03 ND	< 1.406E-04 ND	< 1.24E-14
Other HxCDD	0.00E+00			1.85E+00		
Total HxCDD	< 1.51E-03 ND			5.41E-03		
1,2,3,4,6,7,8-HpCDD	1.88E-03	1.88E-05	1.79E-15	3.82E-03	3.82E-05	3.39E-15
Other HpCDD	1.51E-03			0.00E+00		
Total HpCDD	3.38E-03			3.82E-03		
OCDD	5.84E-03	5.84E0-6	5.57E-16	1.05E-02	1.05E-05	9.32E-16
Total PCDDs	< 1.28E-02	< 3.18E-03	< 3.03E-13	< 2.19E-02	< 3.64E-03	< 3.23E-13
PCDFs						
2,3,7,8-TCDF	2.89E-03	2.89E-04	2.76E-14	2.61E-03	2.61E-04	2.32E-14
Other TCDF	1.10E-02			6.30E-03		
Total TCDF	1.38E-02			8.91E-03		
1,2,3,7,8-PeCDF	2.44E-03	1.22E-04	1.35E-14	< 1.028E-03 ND	< 5.09E-05 ND	< 4.52E-15 ND
2,3,4,7,8-PeCDF	2.22E-03	1.18E-03	5.88E-04	1.69E-03	8.43E-04	7.48E-14
Other PeCDF	0.00E+00			7.96E-04		
Total PeCDF	< 1.60E-03 ND			3.50E-03		
1,2,3,4,7,8-HxCDF	< 9.84E-04 ND	< 9.84E-05 ND	< 9.39E-15 ND	1.75E-03	1.75E-04	1.55E-14
1,2,3,6,7,8-HxCDF	< 8.92E-04 ND	< 8.92E-05 ND	< 8.51E-15 ND	1.15E-03	1.15E-04	1.02E-14
2,3,4,6,7,8-HxCDF	< 1.17E-03 ND	< 1.17E-04 ND	< 1.11E-14 ND	< 1.08E-03 ND	< 1.08E-04 ND	< 9.60E-15 ND
1,2,3,7,8,9-HxCDF	< 1.29E-03 ND	< 1.29E-04	< 1.23E-14 ND	< 7.32E-04 ND	< 7.32E-05	< 7.19E-15
Other HxCDF	0.00E+00			0.00E+00		
Total HxCDF	1.17E-03			< 4.46E-03		
1,2,3,4,6,7,8-HpCDF	< 1.91E-03 ND	< 1.91E-05 ND	< 1.82E-15 ND	< 4.14E-03 ND	< 4.14E-05 ND	< 3.67E-15 ND
1,2,3,4,6,7,8-HpCDF	< 1.20E-03 ND	< 1.20E-05 ND	< 1.14E-15 ND	< 2.13E-03 ND	< 2.13E-05 ND	< 1.89E-15 ND
Other HpCDF	0.00E+00			0.00E+00		
Total HpCDF	< 2.12E-03 ND			< 4.46E-03 ND		
OCDF	2.93E-03	2.93E-06	3.23E-16	5.41E-03	5.41E-06	4.80E-16
Total PCDFs	< 2.03E-02	< 1.30E-03	< 1.24E-13	< 2.67E-02	< 1.74E-03	< 1.55E-13
Total PCDD/PCDFs	**< 3.32E-02**	**< 4.47E-03**	**< 4.26E-13**	**< 4.86E-02**	**< 5.38E-03**	**< 4.77E-13**

SUMMARY OF RESULTS
FROM THE MAXYMILLIAN TSCA PCB DISPOSAL DEMONSTRATION
AT THE AAG FAIRGROUNDS AVENUE STOCKPILE SITE
IN NORTH ADAMS, MASSACHUSETTS
September 16 - 19, 1998

OPERATING CONDITIONS

Thermal Desorber Operating Data	RUN 1	RUN 1A	RUN 2	RUN 3	AVG	MIN	MAX	STD[1] DEV
Soil Feed Rate, tons/hr	12.36	12.16	12.43	10.99	12.3*	6.18	14.93	1.14
Soil Exit Temperature °F	712	696	708	739	714	577	878	60
Thermal Desorber Face Pressure, in. w.c.	-0.41	-0.44	-0.43	-0.45	-0.43	-0.73	-0.11	0.11
Quench Water pH	7.4	6.2	6.5	6.8	6.7	4.6	8.1	0.21
Vapor Phase Carbon Vessel, Range of Relative Humidity, %		0.05-6.0	< 1-1	0.05-6.0				
Stack Gas Flow Rate, acfm	--	250	227	251				

*Average of Runs 1A & 2, the two highest accepted test runs, to be applied to permit condition.
[1]Average over four test runs.

PCBs DRE

Soil PCB Level, ppm (Maxymillian)	--	847	418	506	677*
Soil Feed Rate, tons/hr	12.36	12.16	12.43	10.99	
Total PCB Flow Rate, lb/hr	--	20.6	10.4	11.1	
PCB Stack Emissions, gm/sec	--	2.310E-08	3.69E-09	1.46E-08	
PCB DRE, %	--	99.9999991	99.9999997	99.9999990	

*Average of the two highest PCB concentration from accepted test runs, applied to permit conditions.

Dioxins/Furans

2,3,7,8 TCDD TEQ Exhaust Gas Concentration, ng/dscm	--	< 6.94E-03	< 6.19E-03	< 7.07E-03
2,3,7,8 TCDD TEQ Exhaust Gas Concentration, ng/dscm, corrected to 7% O_2	--	< 5.33E-03	< 4.72E-03	< 5.83E-03
2,3,7,8 TCDD TEQ Exhaust Gas Emission Rate, gm/sec	--	< 7.67E-10	< 6.07E-13	7.87E-13

Process Stream Split Samples, PCB Analysis, EPA Lab, ppm PCBs

	RUN 1	RUN 1A	RUN 2	RUN 3
Soil Feed PCB Concentration, ppm	79	698	724	861
Treated Soil, ppm	< 2	< 2	< 2	< 2
Personnel Protective Equipment, ppm (Tyvex Coverall, Booties, etc.)				24.2

EXHAUST EMISSIONS

Parameters	RUN 1
Carbon Monoxide, ppmv	3.72
Carbon Dioxide, vol %	15.23
Oxygen, vol %	2.47
HCl, lb/hr	< 7.278E-06
Particulate Matter, gr/dscf	0.0021

VOLATILE ORGANICS, mg/dscm

CHLORINATED COMPOUNDS	RUN 1A	OSHA TWA PELS	ACGIH TWA PELS & OTHERS
Chloromethane	5.762		
Methylene chloride	0.023	25 ppm	25 ppm
Chloroform	< 0.0005 ND	(C)240	(C)240
Carbon tetrachloride	< 0.0009 ND	10 ppm	25 ppm
Bromodichloromethane	< 0.0006 ND		
Dibromochloromethane	< 0.0005 ND		
Trichlorofluoromethane			
Chloroethane	< 0.0004 ND		
1,1-Dichloroethane	< 0.0005	400	400
1,2-Dichloroethane	< 0.0178	50 ppm	200
1,1,1-Trichloroethane	< 0.0008 ND	1900	1900
1,1,2-Trichloroethane	< 0.0009 ND	45	45
1,1,2,2-Tetrachloroethane	< 0.0008 ND	35	35
Vinyl chloride	< 0.0007 ND	1 ppm	1 ppm
1,1-Dichloroethene	< 0.0309		
1,2-Dichloroethene (total)	< 0.0161		
Trichloroethene	< 0.0005		
Tetrachloroethene	< 0.0005 ND		
1,2-Dichloropropane	< 0.0005 ND	350	350
cis-1,3-Dichloropropene	< 0.0004 ND		
trans-1,3-Dichloropropene	< 0.0004 ND		
Chlorobenzene	< 0.0005 ND	350	350

NON-CHLORINATED COMPOUNDS	RUN 1A	OSHA TWA PELS	ACGIH TWA PELS & OTHERS
Acetone	0.0955	2400	2400
2-Butanone	0.0024	590	590
4-Methyl-2-pentanone	< 0.0011 ND		
2-Hexanone	< 0.0018 ND	410	410
Vinyl Acetate			
Carbon disulfide	< 0.0034	20 ppm	60
Bromomethane	< 0.2549		
Bromoform	< 0.0007 ND	5	5
Benzene	0.0037	10 ppm	0.5 ppm
Toluene	< 0.0032	200 ppm	750
Ethylbenzene	0.001	435	435
Styrene	< 0.004	100 ppm	(C)420
Xylene (total)	0.0071	435	435

< = Sum of multi-component concentrations is below detection limit.
ND = Not detected in any tube set or condensate for this run.
(C) designates a ceiling limit. They are to be determined from breathing-zone air samples.
ppm: may be converted to mg/m^3 by the following equation: mg/m^3 = ppm X mol. wt. compound / 24.0 (at standard condition: 68°F and 29.92 psi)

TENTATIVELY IDENTIFIED COMPOUNDS (TICs)[a]

VOCs	Run 1A
Chloroacetic Acid	0.001
Chloromethane	0.016
Hexamethylcyclotrisiloxane	0.0003
Octamethylcyclotetrasiloxane	0.0031
1,2-Butadiene	0.0025
1-Butene	0.0359
1-ethyl-4-methylbenzene	0.0004
1-ethyl-3-methylbenzene	0.0003
1-ethyl-2-methylbenzene	0.0009
1,3,5-Trimetylbenzene	0.0007
2,2',4,46,6'-pentamethyl-3-l(sic)	0.0003
2,4-Dimethylpentane	0.00018
2,3-Dimethylpentane	0.00194
2,4,4-Trimethyl-1-pentene	0.0368
2,4,4-Trimethyl-2-pentene	0.0144
2-Methyl-1-propene	0.0528
2-Methyl-2-propenal	0.0005
(e)-4-Octene	0.001
tris(trimethylsilyl)arsenous(sic)	0.0004
Triophene	0.0002

[a]TIC = Compounds not listed in EPA Method 8270

SEMIVOLATILE ORGANICS (MM5), mg/dscm

COMPOUNDS	RUN 1A	OSHA TWA PELS	ACGIH TWA PELS & OTHERS	
Hexachloroethane	<0.00107 ND	10	10	
Hexachlorobutadiene*	<0.00098 ND			
Hexachloropentadiene*	<0.00976 ND			
Acenaphthene	<0.00195 ND			
Acenaphthylene	<0.00156 ND			
Anthracene	<0.00107 ND	[430][1]		
Benz(a)anthracene	<0.00078 ND			
Dibenz(a,h)anthracene	<0.00098 ND			
1,2-Dichlorobenzene	<0.00166 ND	(C)300	(C)300	
1,3-Dichlorobenzene	<0.00146 ND			
1,4-Dichlorobenzene	<0.00146 ND	450	450	
1,2,4-Trichlorobenze	<0.00215 ND	36[2]		
Hexachlorobenzene	<0.00098 ND			
Nitrobenzene	<0.00078 ND	5	5	
3,3'-Dichlorobenzidine	<0.00976 ND	§1910.1007[a]		§1926.1107[a]
2,4-Dinitrotoluene	<0.00107 ND	1.5	1.5	
2,6-Dinitrotoluene	<0.00098 ND	1.5	1.5	
Naphthalene	0.00241	50	50	
2-Chloronaphthalene	<0.00215 ND			
2-Methylnaphthalene	<0.00176 ND	[4360][2]		
Phenanthrene	<0.00059 BJ	[50][3]		
Fluorene	<0.00127 ND			
Fluoranthene	<0.00098 ND	[2000][6]		

[a] No concentration given. Regulated at 29CFR §xxxx.xxxx

[1]LD_{50}: mg/kg oral, mouse

[2]TLV: mg/m^3 (Threshold Limit Value)

[3]LD_{50}: mg/kg, oral, mouse

[6]LD : mg/kg, oral, rat

SEMIVOLATILE ORGANICS (MM5), mg/dscm (cont'd)

COMPOUNDS	RUN 1A	OSHA TWA PELS	ACGIH TWA PELS & OTHERS
Benzo(b)flouranthenes	<0.00098 ND		
Benzo(k)flouranthenes	<0.00107 ND		
Pyrene	<0.00049 ND	[170][7]	
Benzo(a)pyrene	<0.00078 ND	coal	coal
Indeno(1,2,3-cd)pyrene	<0.00059 ND		
Benzo(g,h,i)perylene	<0.00068 ND		
Chrysene	<0.00049 ND	coal	200[1]
Dibenzofuran	<0.00976 ND		
Isophoronem	<0.00098 ND	140	140
Butyl benzylphthalate	<0.00127 ND	[2330][2]	
Diethyl phthalate	0.00095	5[4]	
Dimethyl phthalate	<0.00068 ND	5	5
Di-n-butyl phthalate	0.00193	5	5
Di-n-octyl phthalate	<0.00127 ND	[6513][5]	
bis(2-Ethyhexyl)phthalate	<0.00293 ND	5	5
Benzoic acid	<0.0000 ND	[2530][10]	
Benzyl alcohol	<0.0000 ND	[4354][12]	
Carbazole*	<0.00029 ND		
2,2'-Oxybis(1-chloropropane)	<0.0000 ND		
4-Bromophenyl phenyl ether	<0.00156 ND		
bis(2-Chloroethyl)ether	<0.00078 ND		
bis(2-Chloroisopropyl)ether	<0.00107 ND		
4-Chlorophenyl phenyl ether	<0.00176 ND		
bis(2-Chloroethoxy)methane	<0.00117 ND		
Phenol	0.00463	19	19
4-Chloro-3-methylphenol	<0.00137 ND		
2-Chlorophenol	<0.00049 ND		
2-Methyl phenol	<0.00117 ND	22[13]	
3/4-Methyl phenol	<0.00156 ND	22[14]	
2,4 Dichlorophenol	<0.00117 ND	[580][2]	
Pentachlorophenol	<0.00146 ND	0.5	0.5
2,4,5-Trichlorophenol	<0.00166 ND		
2,4,6-Trichlorophenol	<0.00117 ND		
2-Nitrophenol	<0.00117 ND		
4-Nitrophenol	<0.00976 ND		
2,4-Dinitrophenol	<0.00976 ND		
4,6-Dinitro-2-methylphenol	<0.00117 ND		
2,4-Dimethylphenol	<0.00976 ND		
4-Chloroaniline	<0.00976 ND		
2-Nitroaniline	<0.00976 ND		
3-Nitroaniline	<0.00976 ND		
4-Nitroaniline	<0.00976 ND	6	6
N-Nitrosodiphenylamine	<0.00341 ND		
N-Nitroso-di-n-propylamine	<0.00107 ND		

[7] LC_{50}: mg/m^3, rat

[2] LD_{50}: mg/kg, oral. rat

[4] TLV: mg/m^3 (Threshold Limit Value)

[5] LD_{50}: mg/kg, oral, mouse

[12] LC_{lo}: mg/m^3 rat

[13] PEL for skin exposure

[14] PEL for skin exposure

DIOXINS/FURANS

PCDDs,	Run 1A Concentration ng/dscm	Run 1A TEQs ng/dscm	Run 1A TEQ Emission Rate, g/s	Run 2 Concentration ng/dscm	Run 2 TEQs ng/dscm	Run 2 TEQ Emission Rate, g/s	Run 3 Concentration ng/dscm	Run 3 TEQs ng/dscm	Run 3 TEQ Emission Rate, g/s
2,3,7,8-TCDD	2.68E-03	2.68E-03	2.96E-13	3.44E-03	3.44E-03	3.38E-13	3.22E-03	3.22E-03	3.59E-13
Other TCDD	7.81E-03			4.59E-03			3.22E-03		
Total TCDD	1.05E-02			8.04E-03			6.45E-03		
1,2,3,7,8-PeCDD	<8.90E-04 ND	<4.45E-04	<4.92E-14	<1.23E-03 ND	<5.60E-04	<5.50E-14	<6.82E-04 ND	<3.41E-04	<3.80E-14
Other PeCDD	0.00E+00			0.00E+00			0.00E+00		
Total PeCDD	<8.90E-04 ND			<1.12E-03 ND			<6.82E-04 ND		
1,2,3,4,7,8-HxCDD	4.88E-03	4.88E-04	5.39E-14	4.88E-03	4.88E-04	4.79E=14	3.97E-03	3.97E-04	4.42E-14
1,2,3,6,7,8-HxCDD	<8.78E-04 ND	<8.78E-05	<9.70E-15	<1.35E-03 ND	<1.35E-04	<1.32E-14	<7.19E-04	<7.19E-05	<8.01E-15
1,2,3,7,8,9-HxCDD	<1.11E-03 ND	<1.11E-04	<1.23E-14	<9.76E-04 ND	<9.76E-05	<9.58E-15	<8.93E-04	<8.93E-05	<9.95E-15
Other HxCDD	0.00E+00			0.00E+00			0.00E+00		
Total HxCDD	4.15E-03			4.31E-03			3.47E-03		
1,2,3,4,6,7,8-HpCDD	3.17E-03	3.17E-05	3.50E-15	3.61E-03	3.61E-05	3.10E-15	1.71E-03	1.71E-05	1.91E-15
Other HpCDD	2.93E-03			0.00E+00			0.00E+00		
Total HpCDD	6.10E-03			3.16E-03			1.71E-03		
OCDD	9.76E-03	9.76E-6	1.08E-15	6.32E-03	6.32E-06	6.20E-16	4.96E-03	4.96E-06	5.53E-16
Total PCDDs	<3.23E-02	<3.86E-03	<4.26E-13	<2.41E-02	<4.76E-03	<4.68E-13	<1.08E-02	<4.15E-03	<4.62E-13
PCDFs									
2,3,7,8-TCDF	1.51E-02	1.51E-03	1.67E-13	4.88E-03	4.88E-04	4.79E-14	1.61E-02	1.61E-03	1.80E-13
Other TCDF	3.37E-02			1.44E-02			6.57E-02		
Total TCDF	4.88E-02			1.92E-02			8.18E-02		
1,2,3,7,8-PeCDF	2.44E-03	1.22E-04	1.35E-14	<8.18E-04 ND			<1.36E-04 ND	<6.82E-06	<7.60E-16
2,3,4,7,8-PeCDF	2.22E-03			1.18E-03	5.88E-04	5.78E-14	1.96E-03	9.80E-04	1.09E-13
Other PeCDF	8.03E-03			3.79E03			8.43E-03		
Total PeCDF	1.27E-02			6.60E-03			1.07E-02		
1,2,3,4,7,8-HxCDF	1.44E-03	1.44E-04	1.59E-14	<6.60E-04 ND	<6.60E-05	<6.48E-15	1.12E-03	1.12E-04	1.24E-14
1,2,3,6,7,8-HxCDF	<4.02E-04 ND	<4.02E-05	<4.45E-15	<5.17E-04 ND	<5.17E-05	<5.07E-15	7.94E-04	7.94E-05	8.84E-15
2,3,4,6,7,8-HxCDF	<5.73E-04 ND	<5.73E-05	<6.33E-15	<7.18E-04 ND	<7.18E-05	<7.05E-15	<5.33E-04 ND	<5.33E-05	<5.94E-15
1,2,3,7,8,9-HxCDF	<5.85E-04 ND	<5.85E-05	<6.47E-15	<7.32E-04 ND	<7.32E-05	<7.19E-15	<5.456E-04 ND	<5.46E-05	<6.08E-15
Other HxCDF	0.00E+00			0.00E+00			0.00E+00		
Total HxCDF	2.93E-03			<6.46E-04 ND			3.22E-03		
1,2,3,4,6,7,8-HpCDF	<1.83E-03 ND	<1.83E-05	<2.09E-15	<1.87E-03 ND	<1.87E-05	<1.83E-15	<1.14E-03 ND	<1.14E-05	<1.27E-15
1,2,3,4,6,7,8-HpCDF	<2.07E-03 ND	<2.07E-05	<2.29E-15	<2.15E-03 ND	<2.15E-05	<2.11E-15	<1.36E-03 ND	<1.36E-05	<1.52E-15
Other HpCDF	0.00E+00			0.00E+00			0.00E+00		
Total HpCDF	<1.95E-03 ND			<2.01E-03 ND			<1.23E-03		
OCDF	2.93E-03	2.93E-06	3.23E-16	<2.15E-03 ND	<2.15E-06	<2.11E-15	<8.80E-04 ND	<8.80E-07	<9.81E-17
Total PCDFs	<7.12E-02	<3.09E-03	<3.41E-13	<3.55E-02	1.42E-03	<1.40E-13	<1.18E-01	<7.07E-03	<3.26E-13
Total PCDD/PCDF	<1.03E-01	<6.94E-03	<7.67E-1	<5.95E-02	<6.19E-03	<6.07E-13	<1.18E-01	<7.07E-03	<7.87E-13

SUMMARY OF RESULTS
FROM THE MAXYMILLIAN TSCA PCB DISPOSAL DEMONSTRATION
AT THE SOUTH GLEN FALLS DRAG STRIP SITE
IN MOREAU, NEW YORK
May 29 - 31, 1996 and August 23, 1996

Background: Maxymillian submitted TSCA (Toxic Substances Control Act) Permit Applications and Demonstration Test Plans on December 6, 1995, and additional submissions on February, 1996, to demonstrate its mobile Indirect Source Thermal Desorption Unit for removing PCBs from soil. The site selected for demonstrating the Indirect System was a remedial site managed by the General Electric Company. The site is located at the South Glens Falls Drag Strip, Moreau, New York.

Maxymillian submitted the "Draft Demonstration Test Plan" and "TSCA PCB Disposal Permit Application" submitted December 15, 1995 and February 15, 1996 for a Toxic Substances Control Act (TSCA) PCB disposal operating permit for the Maxymillian IDS. Results of the demonstration are summarized below.

OPERATING CONDITIONS

Thermal Desorber Operating Data	RUN 1	RUN 2	RUN 3	Post Run
Soil Feed Rate, tons/hr	13.5	12.9	13.5	11.5
Soil Exit Temperature °F	692	650	655	722.7
Thermal Desorber Face Pressure, in. w.c.	-0.23	-0.41	-0.44	-0.44
Flow to Steam Stripping Tower, gpm	0.23	0.24	0.25	0.25
Quench Water pH	7.64	7.47	7.52	7.51

PCBs DRE

Soil PCB Level, ppm (Maxymillian)	93.2	90.0	99.3	106.0
(EPA Lab)	142[a]	117	106[a]	
Soil Feed Rate, tons/hr	13.5	12.9	13.5	11.5
Total PCB Flow Rate, lb/hr	2.52	2.32	2.68	2.44
PCB Stack Emissions, lb/hr	7.9E-07	5.2E-07	5.6E-07	1.04E-05
PCB Stack Emissions, gm/hr	1.01E-07	6,50E-08	7.11E-07	1.32E-06
PCB DRE	99.99996	99.999978	99.99979	99.999570
PCB DRE Using EPA Lab Soil Results	0.895	1.99	1.08	0.33

Dioxins/Furans

2,3,7,8 TCDD TEQ Exhaust Gas Concentration, ng/m^3	0.45	0.20	1.7	NA
2,3,7,8 TCDD TEQ Exhaust Gas Emission Rage, gm/sec	< 2.14E-11	< 1.59E-11	< 1.20E-11	NA

OPERATING CONDITIONS: (cont"d)

Process Stream Split Samples, PCB Analysis, EPA Lab, ppm PCBs

	RUN 1	RUN 2	RUN 3	Post Run
Soil Feed PCB Concentration	142[a]	117	106[a]	NA
Treated Soil	< 2	< 2	< 2	NA
Filter Cake, Water Treatment	311 (Pre-Test)		764	NA
Personnel Protective Equipment (Tyvex Coverall, Booties, etc.)			2.0	NA

[a] Average of two analysis.

EXHAUST EMISSIONS

Parameters	RUN 1	RUN 2	RUN 3	Post Run
Total hydrocarbon, ppmv	22,482	20,374	28,147	NA
Carbon Monoxide, ppmv	3.72	3.26	3.01	NA
Carbon Dioxide, vol %	11.78	10.73	14.16	NA
Oxygen, vol %	14.51	12.63	10.37	NA
HCl, lb/hr	2.78E-04	<4.73-04	<3.30E-03	NA
Particulate Matter, gr/dscf	0.0018	<0.0020	<0.0010	NA

VOLATILE ORGANICS, mg/dscm

CHLORINATED COMPOUNDS	RUN 1	RUN 2	RUN 3	OSHA TWA PELS	ACGIH TWA PELS & OTHERS
Chloromethane	< 5.762	< 0.882	<12.791		
Methylene chloride	< 0.0092	< 0.0049	< 0.0009	25 ppm	25 ppm
Chloroform	< 0.0002 ND	< 0.0001 ND	< 0.0002 ND	(C)240	(C)240
Carbon tetrachloride	< 0.0004 ND	< 0.1269	< 0.4120	10 ppm	25 ppm
Bromodichloromethane	< 0.0003 ND	< 0.0001 ND	< 0.0002 ND		
Dibromochloromethane	< 0.0006 ND	< 0.0001 ND	< 0.0003 ND		
Trichlorofluoromethane	< 0.0019	< 0.0013	< 0.0002 ND		
Chloroethane	< 0.0008 ND	< 0.0004 ND	< 0.0006 ND		
1,1-Dichloroethane	< 0.0002 ND	< 0.0001 ND	< 0.0002 ND	400	400
1,2-Dichloroethane	< 0.0002 ND	< 0.0001 ND	< 0.0002 ND	50 ppm	200
1,1,1-Trichloroethane	< 0.0003 ND	< 0.0001 ND	< 0.0002 ND	1900	1900
1,1,2-Trichloroethane	< 0.0006 ND	< 0.0001 ND	< 0.0003 ND	45	45
1,1,2,2-Tetrachloroethane	< 0.0002 ND	< 0.0001 ND	< 0.0002 ND	35	35
Vinyl chloride	< 0.0005 ND	< 0.0094	< 0.0004 ND	1 ppm	1 ppm
1,1-Dichloroethene	< 0.0005 ND	< 0.0001 ND	< 0.0004 ND		
trans-1,2-Dichloroethene	< 0.0004 ND	< 0.0001 ND	< 0.0003 ND		
cis-1,2-Dichloroethene	< 0.0004 ND	< 0.0001 ND	< 0.0003 ND		
Trichloroethene	< 0.0004 ND	< 0.0001 ND	< 0.0002 ND		
Tetrachloroethene	< 0.0508	< 0.0001 ND	< 0.0002		
1,2-Dichloropropane	< 0.0003 ND	< 0.0001 ND	< 0.0002 ND	350	350
cis-1,3-Dichloropropene	< 0.0003 ND	< 0.0001 ND	< 0.0002 ND		
trans-1,3-Dichloropropene	< 0.0004 ND	< 0.0001 ND	< 0.0004 ND		
Chlorobenzene	< 0.0003	< 0.0001	< 0.0001	350	350

VOLATILE ORGANICS, mg/dscm (cont'd)

NON-CHLORINATED COMPOUNDS	RUN 1	RUN 2	RUN 3	OSHA TWA PELS	ACGIH TWA PELS & OTHERS
Acetone	4.9088	< 0.1184	< 1.8749	2400	2400
2-Butanone	< 0.6108	< 0.0001 ND	< 0.0002 ND	590	590
4-Methyl-2-pentanone	< 0.0001 ND	< 0.0001 ND	< 0.0002 ND		
2-Hexanone	< 0.0003	< 0.0001 ND	< 0.0003 ND	410	410
Vinyl Acetate	< 0.0003 ND	< 0.0166	< 0.0600		
Carbon disulfide	< 0.0001	< 0.0008	< 0.0001 ND	20 ppm	60
Bromomethane	< 0.0047	< 0.0040	< 0.0006 ND		
Bromoform	< 0.0005 ND	< 0.0001 ND	< 0.0002 ND	5	5
Benzene	< 0.4253	< 0.0001 ND	< 0.0003 ND	10 ppm	0.5 ppm
Toluene	< 0.0003 ND	< 0.0107	< 0.0279	200 ppm	750
Ethylbenzene	< 0.0108	< 0.0023	< 0.0063	435	435
Styrene	< 0.0455	< 0.0067	< 0.0234	100 ppm	(C)420
m/p-Xylene	< 0.0407	< 0.0064	< 0.0203	435	435
o-Xylene	< 0.0304	< 0.0044	< 0.0160	435	435

< = Sum of multi-component concentrations is below detection limit.
ND = Not detected in any tube set or condensate for this run.

(C) designates a ceiling limit. They are to be determined from breathing-zone air samples.
ppm: may be converted to mg/m^3 by the following equation: mg/m^3 = ppm X mol. wt. compound / 24.0 (at standard condition: 68°F and 29.92 psi)

SEMIVOLATILE ORGANICS (MM5), mg/dscm

COMPOUNDS	RUN 1	RUN 2	RUN 3	OSHA TWA PELS	ACGIH TWA PELS & OTHERS
Hexachloroethane	< 0.00015 ND	< 0.00017 ND	< 0.00037 ND	10	10
Acenaphthene	0.00039 J	0.00016 J	0.00066 J		
Acenaphthylene	0.00081 J	0.00046 J	0.00206 J		
Anthracene	< 0.00004 ND	0.00008 J	0.00011 ND		[430][15]
Benz(a)anthracene	< 0.00004 ND	< 0.00005 ND	0.00027 J		
Dibenz(a,h)anthracene	< 0.00004 ND	< 0.00004 ND	0.00013 J		
1,2-Dichlorobenzene	< 0.00009 ND	< 0.00010 ND	< 0.00022 ND	(C)300	(C)300
1,3-Dichlorobenzene	< 0.00008 ND	< 0.00009 ND	< 0.00019 ND		
1,4-Dichlorobenzene	< 0.00008 ND	< 0.00008 ND	< 0.00020 ND	450	450
1,2,4-Trichlorobenzene	< 0.00009 ND	< 0.00009 ND	< 0.00022 ND		36[16]
Hexachlorobenzene	< 0.00011 ND	< 0.00013 ND	< 0.00032 ND		
Nitrobenzene	< 0.00007 ND	< 0.00008 ND	< 0.00019 ND	5	5
3,3'-Dichlorobenzidine	< 0.00010 ND	< 0.00011 ND	< 0.00015 ND	§1910.1007[a]	§1926.1107[a]
2,4-Dinitrotoluene	< 0.00017 ND	< 0.00019 ND	< 0.00045 ND	1.5	1.5
2,6-Dinitrotoluene	< 0.00019 ND	< 0.00020 ND	< 0.00050 ND	1.5	1.5
Naphthalene	0.03102 B	0.01547 B	0.01005 B	50	50
2-Chloronaphthalene	< 0.00005 ND	< 0.00006 ND	< 0.00014 ND		

[a] No concentration given. Regulated at 29CFR §xxxx.xxxx

[15] LD_{50}: mg/kg oral, mouse

[16] TLV: mg/m^3 (Threshold Limit Value)

SEMIVOLATILE ORGANICS (MM5), mg/dscm (cont'd)

COMPOUNDS	RUN 1	RUN 2	RUN 3	OSHA TWA PELS	ACGIH TWA PELS & OTHERS
2-Methylnaphthalene	0.01603	0.01080	0.00938		[4360][2]
Phenanthrene	0.00032 BJ	0.00028 J	0.00021 BJ		[50][17]
Fluorene	0.00043 J	0.00020 J	0.00022 J	-	
Fluoranthene	0.00008 J	0.00013 J	< 0.00009 ND		[2000][6]
Benzo(b)flouranthenes	0.00049 J	< 0.00004 ND	< 0.00097 J	-	
Benzo(k)flouranthenes	0.00010 BJ	< 0.00005 ND	0.00019 BJ	-	
Pyrene	< 0.00004 ND	< 0.00004 ND	0.00009 J		[170][7]
Benzo(a)pyrene	0.00036 J	< 0.00005 ND	0.00044 J	coal	coal
Indeno(1,2,3-cd)pyrene	0.00022 J	< 0.00003 ND	0.00021 J	-	
Benzo(g,h,i)perylene	0.00038 J	0.00002 ND	0.00027 J	-	
Chrysene	< 0.00004 ND	< 0.00004 ND	0.00065 J	coal	200[1]
Dibenzofuran	0.00138 J	0.00043 J	0.00112 J		
Isophorone	< 0.00004 ND	< 0.00004 ND	< 0.00010 ND	140	140
Hexachlorobutadiene	< 0.00013 ND	< 0.00014 ND	< 0.00035 ND		
Hexachloropentadiene	< 0.00018 ND	< 0.00020 ND	< 0.00048 ND		
Butyl benzylphthalate	0.00049 BJ	0.00007 ND	0.00042 BJ		[2330][2]
Diethyl phthalate	0.00387 BJ	0.00209 BJ	0.00240 BJ		5[4]
Dimethyl phthalate	< 0.00004 ND	< 0.00005 ND	< 0.00012 ND	5	5
Di-n-butyl phthalate	0.00150 BJ	0.00491 BJ	0.00440 BJ	5	5
Di-n-octyl phthalate	0.00037 BJ	< 0.00004 ND	0.00027 BJ		[6513][5]
bis(2-Ethyhexyl)phthalate	0.00413 BJ	0.00462 BJ	0.00694 B	5	5
Benzoic acid	0.06074 B	0.03804 B	0.01327 B		[2530][10]
Benzyl alcohol	< 0.00016 ND	< 0.00018 ND	< 0.00040 ND		[4354][12]
2,2'-Oxybis(1-chloropropane)	< 0.00005 ND	< 0.00006 ND	< 0.00013 ND		
4-Bromophenyl phenyl ether	< 0.00015 ND	< 0.00018 ND	< 0.00046 ND		
bis(2-Chloroethyl)ether	< 0.00009 ND	< 0.00011 ND	< 0.00023 ND		
4-Chlorophenyl phenyl ether	< 0.00010 ND	< 0.00011 ND	< 0.00027 ND		
bis(2-Chloroethoxy)methane	< 0.00007 ND	< 0.00008 ND	< 0.00019 ND		
Phenol	0.03208 B	0.00914 B	0.00912 B	19	19
4-Chloro-3-methylphenol	< 0.00011 ND	< 0.00011 ND	< 0.00027 ND		
2-Chlorophenol	< 0.00008 ND	< 0.00010 ND	< 0.00021 ND		
2-Methyl phenol	0.00811	0.00076 J	< 0.00023 ND		22[13]
3/4-Methyl phenol	0.00370 J	0.00096 J	< 0.00023 ND		22[14]
2,4 Dichlorophenol	< 0.00010 ND	< 0.00011 ND	< 0.00026 ND		[580][2]
Pentachlorophenol	< 0.00018 ND	< 0.00022 ND	< 0.00056 ND	0.5	0.5
2,4,5-Trichlorophenol	< 0.00014 ND	< 0.00015 ND	< 0.00036 ND		
2,4,6-Trichlorophenol	< 0.00013 ND	< 0.00014 ND	< 0.00034 ND		
2-Nitrophenol	< 0.00016 ND	< 0.00017 ND	< 0.00041 ND		
4-Nitrophenol	< 0.00037 ND	< 0.00039 ND	< 0.00096 ND		
2,4-Dinitrophenol	< 0.00043 ND	< 0.00046 ND	< 0.00113 ND		
4,6-Dinitro-2-methylphenol	< 0.00024 ND	< 0.00029 ND	< 0.00073 ND		
2,4-Dimethylphenol	< 0.00009 ND	< 0.00010 ND	< 0.00023 ND		

[17] LD_{50}: mg/kg, oral, mouse

[6] LD_{50}: mg/kg, oral, rat

[7] LC_{50}: mg/m^3, rat

[2] LD_{50}: mg/kg, oral. rat

[4] TLV: mg/m^3 (Threshold Limit Value)

[5] LD_{50}: mg/kg, oral, mouse

[12] LC_{lo}: mg/m^3 rat

[13] PEL for skin exposure

[14] PEL for skin exposure

SEMIVOLATILE ORGANICS (MM5), mg/dscm (cont'd)

COMPOUNDS	RUN 1	RUN 2	RUN 3	OSHA TWA PELS	ACGIH TWA PELS & OTHERS
4-Chloroaniline	< 0.00008 ND	< 0.00009 ND	< 0.00020 ND		
2-Nitroaniline	< 0.00014 ND	< 0.00016 ND	< 0.00038 ND		
3-Nitroaniline	< 0.00018 ND	< 0.00020 ND	< 0.00048 ND		
4-Nitroaniline	< 0.00023 ND	< 0.00025 ND	< 0.00061 ND	6	6
N-Nitrosodiphenylamine	0.00042 J	0.00078 J	0.00116 J		
N-Nitroso-di-n-propylamine	< 0.00011 ND	< 0.00013 ND	< 0.00028 ND		
PCDD/PCDF, ng/dscm	Run 1	Run 2	Run 3		
PCDDs					
2,3,7,8-TCDD	2.42E-03	< 2.48E-03	< 1.56E-02		
Other TCDD	0.00E+00	0.00E+00	1.22E-01		
Total TCDD	2.42E-03	2.48E-03	1.38E-01		
1,2,3,7,8-PeCDD	< 4.83E-03	< 6.21E-03	1.30E-02		
Other PeCDD	7.25E-03	0.00E+00	6.49E-02		
Total PeCDD	1.21E-02	6.21E-03	7.79E-02		
1,2,3,4,7,8-HxCDD	< 2.42E-03	< 6.21E-03	< 2.60E-03		
1,2,3,6,7,8-HxCDD	4.83E-03	< 3.11E-03	< 5.19E-03		
1,2,3,7,8,9-HxCDD	< 7.25E-03	< 3.11E-03	< 7.79E-03		
Other HxCDD	2.66E-02	0.00E+00	3.12E-02		
Total HxCDD	4.11E-02	< 3.11E-03	4.67E-02		
1,2,3,4,6,7,8-HpCDD	2.42E-02	9.32E-03	2.08E-02		
Other HpCDD	2.90E-02	6.21E-03	#.12E-02		
Total HpCDD	5.32E-02	1.55E-02	5.19E-02		
OCDD	5.56E-02	2.17E-02	< 2.86E-02		
Total PCDDs	< 1.64E-01	< 4.91E-02	< 3.43E-01		
Sub-Total TEQ 2,3,7,8-TCDD	< 6.58E-03	< 6.95R-03	< 2.39E-02		
PCDFs					
2,3,7,8-TCDF	2.03E-01	1.93E-01	3.35E+00		
Other TCDF	1.22E+00	1.39E+00	2.78E+01		
Total TCDF	1.43E+00	1.58E+00	3.12E+01		
1,2,3,7,8-PeCDF	4.11E-01	2.30E-01	2.10E+00		
2,3,4,7,8-PeCDF	2.66E-01	1.43E-01	1.45E+00		
Other PeCDF	1.98E+00	1.21E-01	1.15E+01		
Total PeCDF	2.66E+00	1.58E+00	1.50E+01		
1,2,3,4,7,8-HxCDF	1.52E-01	6.83E-02	4.67E-01		
1,2,3,6,7,8-HxCDF	7.73E-02	3.42E-02	2.13E-01		
2,3,4,6,7,8-HxCDF	4.83E-02	< 1.55E-02	1.48E-01		
1,2,3,7,8,9-HxCDF	< 2.17E-03	< 3.11E-03	5.19E-03		
Other HxCDF	3.00E-01	1.15E-01	1.01E+00		
Total HxCDF	5.80E-01	2.36E-01	1.84E+00		
1,2,3,4,6,7,8-HpCDF	< 5.32E-02	< 1.86E-02	1.12E-01		
1,2,3,4,6,7,8-HpCDF	< 7.25E-03	< 3.11E-03	7.79E-03		
Other HpCDF	0.00E+00	3.11E-03	3.90E-02		
Total HpCDF	2.66E-02	< 2.48E-02	1.58E-01		
OCDF	4.35E-02	1.24E-02	1.82E-02		
Total PCDFs	< 4.73E+00	< 3.44E+00	4.82E+01		
Sub-Total TEQ 2,3,7,8-TCDF	< 2.02E-01	< 1.15E-01	1.25E+00		
Total TEQ 2,3,7,8-TCDF	**< 2.09E-01**	**< 1.21E-01**	**< 1.28E+00**		

Results of R&D Studies
South Glen Falls Drag Strip, Moreau, New York
1995

1. Maxymillian Technologies, Inc. (Maxymillian) submitted a TSCA (Toxic Substances Control Act) Research and Development Permit Application on June 2, 1995 to the Chemical Management Division (CMD) to test its mobile Indirect Source thermal desorption unit to remove PCBs from soil. MTI provided follow up submissions for clarification and detail on the R&D operations on June 23 and August 2, 1995 and the Work Plan dated September 15, 1995. Results of the studies are summarized in Item 7 below.

2. R&D Test Results: A series of tests were performed under a TSCA R&D approval issued December 11, 1995. The tests were completed in January 1966 at the South Glens Falls Drag Strip site. Using a two-tiered approach, the initial tier focused on determining suitable operating conditions using soil containing PCBs less than 50 ppm. For the second tier, Maxymillian selected operating conditions appropriate for treating PCB contaminated soil and sampled and monitored process streams. The following tables summarized results of the tests.

TIER I OPERATIONS

Run No	Treated Soil Feed Rate, tph	Soil Exit Temp, °F	PCBs in Waste Feed, ppm	PCBs in Treated Soil, ppm	Chamber Draft, " w.c.	Quench Water pH
1	7.04	904.0	34.1	0.017	-0.388	8.32
2	8.00	842.2	19.8	0.012	-0.476	8.12
3	8.27	822.2	8.4	0.040	-0.469	6.82
4	6.95	690.2	8.5	0.083	-0.512	7.37
5	7.60	604.2	27.2	0.145	-0.462	6.37
6	8.36	540.0	16.5	0.566	-0.487	7.33
7	6.26	625.0	15.4	0.286	-0.847	*
8	15.44	630.4	18.9	0.181	-0.570	8.77
9	12.37	582.9	10.8	0.036	-0.474	6.62
10	14.44	646.2	7.1	0.073	-0.467	7.66
10a	15.66	454.3	12.9	1.49	-0.490	9.14
10b	16.30	600.0	10.2	0.684	-0.267	7.17
10c	15.53	658.1	20.8	0.181	-	-

* pH probe malfunctioned

TIER II OPERATIONS:

Run No	Soil Feed Rate, tph	Treated Soil Exit Temp, °F	PCBs in Waste Feed, ppm	PCBs in Treated Soil, ppm	Chamber Draft " w.c.	Quench Water pH	Parti-culates, gr/dscf	HCl, lb/hr
1	6.97	880.8	29.0	0.023	-0.464	6.92	0.0024	4.16 E-04
2	7.02	887.0	18.1	0.010	-0.464	7.01	0.0070	5.01 E-04
3	7.20	650.4	(15.8)*	0.160	-0.477	7.17	NA	NA
4	8.13	644.0	(25.0)*	0.446	-0.495	7.16	NA	NA

* Calculated from R&D PCB soil feed rate in R&D Report

	PCB Emis-	PCDD/PCDF Emission	PCDD/PCDF TEF Emis-

Run No	THC, ppmv	CO, ppm	CO_2, %v	O_2, %v	sion Rate g/sec	Rate g/sec	sion Rate g/sec
1	169	1.1	9.5	11.8	8.79E-07	1.76E-06	2.64E-11
2	257	1.7	8.3	15.5	1.23E-06	5.15E-09	6.69E-11
3	12224	4.69	12.1	13.5	2.43E-07	<3.86E-10	1.10E-09
4	17666	1.681	13.7	13.0	1.01E-06	<1.26E-11	2.43E-11

Run No	PCB Stack Concentration µg/dscm	PCDD/PCDF Stack Concentration ng/dscm	PCDD/PCDF TEF Stack Concentration ng/dscm
1	14.1	34.6	0.52
2	18.2	195	2.53
3	3.76	<11.1	<0.318
4	17.3	37.5	0.722

PROCESS WATER RESULTS:

Date Processed	Volume, gallons	Influent PCB Level, µg/L	Effluent PCB Level, µg/L
12/18/95	7,945	263 (Total PCBs)	ND (0.5 MDL)
12/21/95	7,474	822	ND
1/2/96	5,303	524	ND
1/2596	7,097	92.1	ND

TOXICITY AND EXPOSURE

The Occupational Safety and Health Agency (OSHA) has developed a series of worker related exposure limits or permissible exposure limit (PELs), based generally on time-weighed average (TWA) of 8 - 12 hour durations. In the absence of PELs, where recommendations for worker exposure criteria from the American Conference of Government Industrial Hygienists (ACGIH) were available as threshold limit value (TLVs), these values were used. Where neither were available, criteria other than PELs or TLVs in the form of toxicity data were presented. As a basis of comparison, compounds for which PELs and toxicity data exists are listed below. Toxicity is addressed below:

a. LD_{50}: dosage in mg compound/kg body weight which resulted in 50% fatality of laboratory animals
   1) oral: dosage introduced orally
   2) intravenous: dosage introduced intravenously
b. LC_{50}: concentration in mg compound/m^3 air which resulted in 50% fatality in laboratory animals
c. LC_{lo}: lowest concentration in mg compound/m^3 air which resulted in fatality in laboratory animals
d. TD_{lo}: lowest dosage resulting in toxic effects, human
e. LD_{lo}: lowest dosage resulting in fatality, human
f. species exposed: (H) = human; (M) = mouse; (R) = rat
g. [5 yr] = length of exposure to dosage, 5 years

PELs, TLVs and toxicity data for various compounds to provide basis for comparison are presented:

Compounds	PEL mg/m^3	TLV mg/m^3	LD_{50} mg/kg	LC_{50} mg/m^3	LC_{lo} mg/m^3
Benzene	30	30	3306 (R) 4700 (M)	10,000 (R) 9,980 (M)	65 [5 yr] 6,000 [5 mo](H)
Phenol	19	19	317 (R) 14,000 (LD_{lo}) 140 (LD_{lo})	316 (R) 270 (M)	177 (M)
Chloroform	240	48	908 (R)	75 (R) 36 (M)	120,000 [5 mo](H) 28,000
Carbon Tetra-chloride	61	30	2,800 (R) 8,260 (M) 43 (LD_{lo}) 1,700 (TD_{lo}) 1,800 (TD_{lo})	49,300 (R) 9,526 (M)	6,100 300,000 [5 mo](H)
bis(2-Ethyl-hexyl) phthalate	5	5	30,600 (R) 30,000 (M) 143 (TD_{lo})		